A MANUAL OF PSYCHOLOGY

BY

G. F. STOUT, M.A. CAMB. AND OXON., LL.D. ABERDEEN

FELLOW OF THE BRITISH ACADEMY
PROFESSOR OF LOGIC AND METAPHYSICS IN ST. ANDREWS UNIVERSITY
LATE WILDE READER IN MENTAL PHILOSOPHY IN THE UNIVERSITY OF OXFORD
LATE EXAMINER AT LONDON UNIVERSITY
AUTHOR OF "THE GROUNDWORK OF PSYCHOLOGY," ETC.

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PREFACE TO THE THIRD EDITION.

In the present edition, the greater part of the book has been rewritten and the rest carefully revised. The changes introduced are so extensive that I can here only refer to some of the most important.

Two Chapters, those on Instinct and on Attention, have been added.

In dealing with the connexion of Body and Mind, I now give prominence to the arguments of recent writers who champion the theory of Interaction as against Parallelism. I do not, however, commit myself to agreement with these writers. I am content to leave the question open and to point out that for psychological purposes it does not make any essential difference which hypothesis we adopt.[1]

In my analysis of the fundamental presuppositions of Psychology, I have endeavoured to bring out clearly the special nature and function of Presentation. It will be seen that I do not here follow Dr. Ward in his comprehensive use of this word as covering "whatever is the object of the understanding when a man thinks." I cannot do this because the term is the only convenient one which I can find for a certain special kind of object, possessing a distinctive character and function of the utmost importance. My use of the word now conforms, as it did not before, to that adopted in my *Analytic Psychology*.

[1] Personally, I still adhere to Parallelism.

My account of the development of the Perception of External Objects has been recast as a whole and in detail. I have now attempted to distinguish clearly between what we may safely attempt to explain as acquired through mental processes in accordance with psychological laws and what we ought, from this point of view, to regard as primary—at least provisionally. I have given a new analysis of the distinction between "external reality" and sensible appearance. I have also introduced important changes in the treatment of the Perception of Spatial Relations.

I hope and believe that the extensive alterations and additions introduced in the present edition, besides improving the book in other respects, will make it more readily and thoroughly intelligible to students.

I owe grateful acknowledgment to Professor Mackenzie for useful suggestions, and also to my brother, Mr. J. F. Stout, for his careful and valuable work in correcting proofs and in making an Index.

G. F. STOUT.

CRAIGARD, ST. ANDREWS,
July 1913.

EXTRACT FROM THE PREFACE TO THE FIRST EDITION.

THE present work contains an exposition of Psychology from a genetic point of view. A glance at the table of Contents will show that the order followed is that of the successive stages of mental development. The earlier stages have been copiously illustrated by reference to the mental life of animals. The phases through which the ideal construction of Self and the world has passed are illustrated by reference to the mental condition of the lower races of mankind.

The shortcoming which I have been most anxious to avoid is sketchiness. I am convinced that the study of Psychology is of no use to the student unless he is able to live himself into psychological problems, so as to acquire a real power of thinking for himself on psychological topics. For this purpose cut and dried statements skimming important questions are of no avail. An effective introduction to Psychology must be clothed in living flesh and blood. The most essential gift to be imparted to the beginner is a real interest in the subject, and a real power of dealing with it even when familiar formulas fail him. He ought to be able to do riders in Psychology as he does riders in Euclid. It is true that there are students who cannot advance so far from lack of natural endowment. But even for them a treatment full enough

to be interesting and so rememberable is better than arid and dogmatic statements. Certainly the teacher who needs Psychology for educational purposes would do better to leave the subject alone altogether than to learn it in a merely external way.

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MANUAL OF PSYCHOLOGY.

INTRODUCTION.

CHAPTER I.

THE SCOPE OF PSYCHOLOGY.

§ 1. **The Psychological Point of View.**—Suppose that a man is wholly absorbed in watching the waves as they rush in upon the sea shore, and in listening to the sound they make. In this total situation we distinguish three constituents: (1) the man who is watching and listening: this factor of the total situation is the Subject. (2) The movement and sound of the waves to which he is attending: this is the Object with which the subject is occupied at the moment. (3) The watching and listening, which are activities of the subject in relation to its object.

Now, we have supposed that the man is wholly absorbed in attending to the movement and sound of the waves. This means that he is not attending to himself or to his own acts of watching and listening. He is preoccupied in attending to his object, and has therefore no attention to spare for himself and his own states and activities. In other words, his point of view is Objective. We, on the

contrary, who are concerned with the total situation, are taking account of all the three factors which it involves: subject, object, and the relation of the subject to his object.

Unlike the man himself we are not thinking only of the movement and sound of the waves. We are thinking also of the subject who is attending to the waves and of the act of attention. In other words, our point of view, as distinguished from the man's own point of view, is Subjective. Now it is the subjective point of view which is distinctively characteristic of Psychology as contrasted with other branches of human knowledge. The subjective attitude is not, of course, confined to outsiders who are looking on at what others are doing. In our illustration the man himself may pass at any moment from the purely objective to the psychological point of view. If, for instance, someone breaks in upon his contemplation with the question, What are you doing? and if he turns round with a start and answers "I am watching the waves," he is no longer attending only to the waves, but also to himself, and his own states and actions. When a subject thus attends to himself and his own states and actions, he is said to be introspective; he does not merely look outwards, so to speak, at things, but turns inward upon himself.

From this explanation of what is meant by the psychological or subjective point of view, it should be clear that this cannot involve an entire refusal to take account of objects. This is impossible, because subjective states and activities cannot be conceived or described without reference to their objects. A subject is a mind, and a mind only exhibits its distinctive nature in *minding* things. It is impossible to name a thought without naming it as the thought of something. Thus psychology

must constantly refer to objects. What is really distinctive of its procedure is that it takes account of objects only in their relation to a subject; it is concerned with objects only in so far as they are objects for some conscious individual—only in so far as some mind *minds* them, or in so far as someone *immediately experiences* them. In this last phrase we have introduced a new conception which requires a special explanation in order to bring out fully the nature of the psychological problem—the conception of immediate experience.

§ 2. **Immediate Experience.**—An individual mind not only apprehends objects. It is also constantly living through various experiences. What this means will become clear if we consider an example. Compare the two statements: "I am glad that it is going to rain"; "I am sorry that it is going to rain." The first of these statements expresses a certain relation of the mind to an object; the second expresses a different relation of the mind to the same object. The common object is the meaning which the speaker attaches to the words "that it is going to rain." Whether it actually will rain or not, what is signified by the words "that it will rain" is something which the speaker thinks of—something which he means or intends to refer to, something which is before his mind. It is therefore, from the psychological point of view, an object. But this object is not itself mental; for what the speaker means or intends when he speaks of rain or uses the words "that it is going to rain" is a kind of occurrence which can only take place in the material world, not in his own mind or the mind of anyone else. It is something of which he thinks: but it is not something which he directly experiences.

On the other hand, if we consider the diverse relations of the mind to its object we find that these cannot be

reduced simply to differences in the nature of the object itself. The difference between my being glad that it is going to rain and my being sorry that it is going to rain consists in a qualitative difference in the feelings which I feel with reference to the same object. Of course, in feeling glad or sorry I may also have cognisance of the fact that I feel glad or sorry. It may be that I always do have some cognisance of the fact, however dimly and vaguely. But the fact itself consists in the feeling being felt and not in my knowing about it. The most general formula for expressing this is by saying that it is a fact of immediate experience.

The distinction between what we immediately experience and what we know about our immediate experience is illustrated by cases of deception exemplifying the scriptural maxim that "the heart is deceitful above all things." A man may feel angry and at the same time think that he does not feel angry; he may feel jealous and yet think that he does not feel jealous. If having an immediate experience were simply identical with knowing that we have it, this would be impossible.

It is characteristic of immediate experiences that they are not in a literal sense shared in common by different minds. Two men, A and B, may both be cognisant of the same fact, *e.g.* the death of a friend of both, C. But each feels his own grief. If they are said to share in a common sorrow this does not mean that A's feeling of sorrow is numerically identical with B's feeling of sorrow. It means rather that the feeling immediately experienced by A and the feeling immediately experienced by B both refer to the same object, the death of C. But A's immediate experience is owned by A only and not by B or any other man; and B's immediate experience is owned by B only and not by any other man.

§ 3. **Immediate Experiences which are primarily Objective.**—So far we have taken account only of a certain class of immediate experiences. We have had in view only those modes of feeling which give specific character to the various ways in which the mind as subject may be related to its objects, according as it is glad or grieved, angry or afraid, likes or dislikes, feels desire or aversion, believes or disbelieves. But it is by no means true that all immediate experiences are of this nature. On the contrary there is a most important class of immediate experiences which are themselves primarily objects rather than ways of feeling in reference to objects.

Under this head come what are called Sensations. Sensations consist in the immediate experiences which arise in connection with brain changes excited by processes in the sense-organs, primarily initiated by impressions from outside the body and also by processes within the body taking place independently of external stimulation. If the eye is stimulated, we immediately experience colour-sensation; and according to the various ways in which the eye may be affected, the colour-sensations differ in quality and brightness. If the ear is stimulated, we experience radically different sensations—those of sound; and according as the ear is variously affected, the resulting sensations differ, *e.g.* in pitch and loudness. If certain nerves terminating in the cavity of the nose are stimulated, we have the immediate experiences which we call sensations of smell. As examples of sensations connected with processes taking place within the body we may refer to the peculiar experiences of nausea, cramp, fatigue, hunger, thirst, headache, toothache, etc.

Sensations due to the action of external agents on the bodily organs are so bound up with our apprehension of material things and their qualities that some difficulty

may be felt, especially in the case of touch and sight, in distinguishing the sensation from the thing which it enables us to perceive.

The student will find himself essentially assisted in making the required distinction if he constantly bears in mind that sensations, like other immediate experiences, are not shared in common by different minds, even when they are perceiving a common object. Each individual experiences his own sensations, not those of others. Two men, A and B, may both perceive the same fire; the fire is their common object, inasmuch as it is what both *mean*. If A says, "This fire is too big," and if B replies, "It isn't," they really contradict each other, because they are referring to the same thing. But though they perceive the same object, each of them in perceiving it experiences his own separate sensation connected with separate processes in his own sense-organs and brain. If A says "I feel warm," and if B replies "I do not," they do not really contradict each other. For what A affirms is that he is experiencing a certain sensation; and what B denies is not that A has this experience, but that he himself has another experience similar to it. Similarly if A says that the fire looks red to him, and B denies that it looks red to *him*, they do not contradict each other. For what A asserts is that in seeing the fire he experiences colour-sensations like those which are usually experienced by normal persons under normal conditions when they see red things; and what B denies is not that A has these sensations, but only that he himself has sensations of the same kind.

Another clue to the distinction between physical things and their qualities, on the one hand, and the sensation which we have in perceiving them, on the other, is supplied by the fact that the existence of the sensations is

Sensations may [illegible] object

capable of being continued independently of what may happen to the things. The sensations have, so to speak, a separate history of their own. After seeing a candle I can retain the sense-experience in the form of a mental picture, though the flame itself has been blown out. The existence of the sense-experience is continued in the mental picture, when the flame itself has ceased to exist. Besides this, we have to take into account dreams and hallucinations. In dreams and hallucinations, the sensations which are ordinarily experienced in perceiving certain bodies are experienced in the absence of these bodies. When a drunkard suffering from *delirium tremens* is said to "see rats," he does not of course really see rats: for there are none to see. But he really experiences sight-sensations such as are experienced when rats are actually seen.

As being immediate experiences, sensations are not merely facts apprehended by individual minds, but are facts forming part of the life history of individual minds. In this respect they differ from all objects which are not immediately experienced. When I think of the fact that the battle of Waterloo was fought in 1815, or that 15 is the half of 30, or that ice is lighter than water, my cognisance of these facts is, in each case, a mental occurrence, and as such falls directly within the province of Psychology. But the facts themselves of which I am cognisant are not mental occurrences; they are not merely facts of my mental history or of the mental history of any other individual. On the other hand, when I am aware of the existence of a sensation of nausea or of a smell-sensation or of a colour-sensation, this does not hold good. The fact that the sensation exists is itself mental as well as the fact that I am cognisant of its existence. Similarly, if I suppose, in the play of fancy, that centaurs exist, or erroneously believe that water is heavier than ice, what I

mean by "centaurs existing" or "water being heavier than ice" is in neither case anything mental: the supposing and believing are so; but not that which is supposed or believed. On the contrary, when I suppose or believe that I am about to feel a toothache, or that someone else is about to feel a toothache, what I mean by "feeling a toothache" is itself something mental.

The word "objective" is frequently used to signify "existing independently of individual minds," and the correlative word "subjective" then signifies "dependent on individual minds." In this use of the terms sensations are not objective but subjective; for their existence seems to be dependent on the individual minds which experience them. But the words "subjective" and "objective" are not required to express this distinction. It may be conveyed quite unambiguously by the terms "mental" and "non-mental," or "mental" and "physical," or "psychical" and "physical."

On the other hand, the words "subjective" and "objective" are much needed in Psychology to express another distinction, the distinction between the states, acts or functions of attending, desiring, liking, willing, believing, etc., and that which is attended to, desired, liked, willed, believed, etc. Whatever is meant, intended, or thought of by the mind, inasmuch as it is meant, intended, or thought of, is the mind's object, whether it be fact or fiction, a mountain or a headache or a geometrical problem. On the other hand, the various relations which the mind has to its objects in minding them and the various immediate experiences involved in these relations are primarily subjective. When I desire to catch a fish, annoy an enemy, or feel warm, then what is meant by the words "catching a fish," "annoying an enemy," or "feeling warm," is in each case the object before my mind;

and my subjective relation to it consists (*a*) in my apprehending it or having cognisance of it or thinking of it, (*b*) in my desiring it.

Now, in this application of the terms "subjective" and "objective," sensations are objective. They are not immediate experiences which enter into the constitution of such subjective states as attending, desiring, liking or disliking, etc.; on the contrary, they are immediate experiences which enter into the constitution of objects apprehended, attended to, desired, liked or disliked. That this is so becomes clear when we consider the part played by sense-experience in the knowledge of the material world. It is through sensation that we become in the first instance conversant with external objects and their qualities; and this takes place in such a way that the apprehension of resemblances, differences, successions and coexistences in the external world is essentially conditioned by the apprehension of resemblances, differences, successions and coexistences of sensations as they occur in immediate experience. We could not in the first instance distinguish a hot body from a cold except by distinguishing the feeling of heat which we experience in touching the hot body from the feeling of cold which we experience in touching the cold body; and to the end, part of what we mean by the objective fact that a thing is hot is that under certain conditions it will so affect our senses as to occasion the sensation of heat. Similarly, the various colours of things, the greenness of grass and the yellowness of buttercups, are primarily apprehended only in apprehending the various qualities of our colour-sensations.

The precise way in which the apprehension of sense-experiences conditions the apprehension of material things is a topic which will be discussed at a later stage, so far as it properly comes within the province of psychology. But

apart from any special investigation, it is clear from the outset that material things are primarily known as having sensible qualities, and that the cognisance of sensible qualities presupposes that sensations and their various relations and combinations are attended to so as to be identified and distinguished. In other words, it presupposes that sensations are, in the psychological sense, primarily objective, as being part of the total object which is before the mind in perceiving material things by the eye or ear or other sense-organ—as being that part of the total object which exists as an immediate experience directly traceable to the change set up in the sense-organ by the agency of the external object and thence transmitted to the brain.

Sensations are not the only immediate experiences which are psychologically objective. We have to bring under the same head those revivals or copies of sensuous experience which are called mental images. At this moment I can call up the mental picture of a horse although no horse is present to my senses so as to be actually seen. In like manner I can command experiences resembling previous sensations of sound or touch without actually hearing or touching. Such revivals of sensation are immediately experienced in the same way as the original sensations themselves, and they have the same title to be regarded as objective. They are not subjective states of attending, liking or disliking, etc., but objects attended to, liked or disliked. Like sensations, they are objects which are immediately experienced.

Are there other objects of this kind besides sensations and those which are ordinarily called images? We shall see in the sequel strong reason for affirming that there are. It is convenient, therefore, to have a common name to cover all the varieties of immediate experience which have an ob-

jective character. We may agree to call all immediate experiences which are primarily objective "Presentations."

§ 4. **Consciousness and Unity of Consciousness.**—All apprehension of objects, all the various ways in which the mind may be related to the objects which it apprehends, such as desiring and believing, and all immediate experiences, including sensations, are, in accordance with psychological usage, spoken of as modes of consciousness.

Wherever there is not total unconsciousness in the sense in which we attribute unconsciousness to a table or a log of wood, consciousness in some mode or degree is present. To quote Professor Ladd: "What we are when we are awake, as contrasted with what we are when we sink into a profound and perfectly dreamless sleep, . . . *that* it is to be conscious. What we are less and less, as we sink gradually down into dreamless sleep, or as we swoon slowly away: and what we are more and more, as the noise of the crowd outside tardily arouses us from our after-dinner nap, or as we come out of the midnight darkness of the typhoid-fever crisis—"[1] *that* is consciousness. The becoming conscious and the becoming unconscious are in all their phases and gradations states of consciousness. They are not states of unconsciousness, nor are they transition states between consciousness and unconsciousness. There are no such transition states. The very dimmest and vaguest feeling accompanying the last stage of sinking into dreamless sleep, or the first stage of gradual awakening, is already consciousness. It may become fuller consciousness, but it cannot become consciousness, for it is that to begin with. If, as some suppose, the dreamless sleep itself is accompanied by some dim feeling, this dim feeling is dim consciousness.

[1] *Psychology, Descriptive and Explanatory*, p. 30.

Modes of consciousness are not found in isolation, but only as parts or phases of a complex whole, possessing a peculiar kind of unity within itself and a peculiar distinctness from all else, a unity and distinctness to which there is nothing analogous in the material world. The unity of different modes of consciousness with each other is expressed by saying that they are phases in the life history of the same conscious individual—the same self or "I." If I believe that a certain ship has been lost with all on board, and if I also believe that X was on board, the two beliefs are connected as modes of my consciousness, and it is possible for me to proceed from them to the further belief that X must have been drowned. On the other hand, if I believe only that the ship has been lost, and if someone else believes only that X was on board, the two beliefs are not connected as modes of the same individual consciousness; there is no possibility of either of us making the inference that X must have been drowned.

The unity of consciousness is clearly implied in such pairs of correlative terms as expectation and disappointment, trial and failure, desire and satisfaction, purpose and fulfilment. An expectation can be disappointed only on condition that both expectation and disappointment fall within the unity of the same consciousness: the disappointment can be experienced only by the individual who formed the expectation. Similarly with the other pairs of correlatives.

All recognition ultimately involves unity of consciousness. A man is seen on one day and again seen on the next day. If it is one person A who sees him on Monday and another person B who sees him on Tuesday, this does not of itself yield the possibility of B identifying the man seen on Monday with the man seen on Tuesday. For this

it is necessary that the same individual B who saw him on the first day should see him again on the second. The two perceptions must be owned by the same self; they must fall within the unity of the same individual consciousness.

The unity of consciousness is radically different in its nature from any unity which can belong to a material thing. Every material thing is extended in space and therefore consists of parts spatially external to each other and spatially separable from each other. It is divisible into component portions, each of which exists independently as a material thing or parcel of matter in the same way as the whole which is constituted by their union. The cup, for instance, which I hold in my hand is apprehended by me as one thing; but the separate subsistence of its parts as distinct bodies is forcibly brought home to me, if it falls on the floor and is broken in fragments.

On the contrary, the unity and distinctness of an individual consciousness is not thus composed of parts, each possessing independently a separable unity and distinctness of the same kind. It cannot be broken into fragmentary thoughts, feelings, and volitions, or fragments of thought, feeling, and volition, each persisting, like the pieces of the cup, when I have ceased to think, feel, and will. A material thing is composed of material things; but a conscious self is not composed of conscious selves.

§ 5. **The Mind or Soul.**—Psychology is concerned with modes of consciousness as connected within the unity of consciousness. But we have been unable to speak of modes of consciousness and their unity without reference to a conscious individual, a mind or self which owns them, and which we name whenever we use the personal pronoun "I." Here we are confronted by the question:—What is this mind which owns consciousness in distinc-

tion from the consciousness which it owns? Now this inquiry may be interpreted in two ways. It may mean:—Has the mind other attributes besides consciousness, and if so, what are they? In this sense the question is perfectly legitimate, and we shall presently deal with it so far as is required for psychological purposes.

But this legitimate inquiry is sometimes confused with a metaphysical problem which the psychologist is in no way bound to consider. It is sometimes confused with the general problem of the distinction and relation between that which possesses attributes and the attributes which it possesses, between the substance to which qualities belong and the qualities which belong to it. The difficulty here is to say what the substance is otherwise than by assigning its qualities, whereas the question is:—"What is the substance as distinguished from its qualities?" "If anyone," says Locke, "should be asked, what is the subject wherein colour or weight inheres, he would have nothing to say, but the solid extended parts: and if he were demanded, what is it that solidity and extension inhere in, he would not be in a much better case than the Indian . . . who, saying that the world was supported by a great elephant, was asked what the elephant rested on; to which his answer was, a great tortoise. But being again pressed to know what gave support to the broad-backed tortoise, he replied, something, he knew not what." Similarly, whenever we are called on to say what a thing is apart from its states, activities, relations, capacities, and other attributes, we are reduced to the position of Locke's Indian. This must be so, because we are required to describe the nature of a thing, and are at the same time forbidden to refer to what alone constitutes its nature.

Are we then to give up using the distinction between attributes and that which possesses them? This is plainly

impossible; for we must use the distinction in order to be able to think at all. All ordinary thought and conduct involves it; common sense and science cannot stir a step without it. Hence whatever account we ultimately give of it must explain and not overthrow its validity and value. If, for instance, we say that the being to which attributes belong is nothing but the totality of the attributes themselves, we must hasten to add that the way in which the attributes are connected with each other is unique; and if we are called on to assign the distinctive nature of the unity which they form with each other, we can discover no possible way of adequately describing it except by saying that they are all attributes of the same thing. Thus, this explanation, which is probably correct, leaves the ordinary working distinction between the thing and its attributes untouched. It permits and demands that common sense and science shall for their special purposes go on using it as they did before critical reflection about it. If this were not so the result of critical reflection would be self-condemned.

This applies to the special case of the mind in relation to modes of consciousness and whatever other attributes we may find reason to ascribe to it. Hence it is wrong to say, as some writers do, that Psychology is *not* the science of mind, but only of mental processes or states. This suggests that we can deal with mental processes or states without reference to their being the processes or states of some conscious individual, some "I" or self. But no one has succeeded or can succeed in doing this, and if anyone did so he would only falsify the facts.

It may be suggested that the subject of consciousness is really the brain, and that in Psychology we ought to proceed on this assumption. Now we need not here discuss the truth of this position. It will be sufficient if we inquire

what it must be taken to mean if it is to be rendered intelligible.

Approaching the question from this point of view we discover that what is meant cannot be that there is not a mind. It can only be meant that the same thing which is a mind is also a brain; that on account of its possession of certain attributes we name it a material thing, and that on account of its possession of certain other attributes we name it a mind. But the bodily aspect of its nature remains radically distinct from the mental. Thought and feeling must be recognised, on any view, as fundamentally different from any material process, and the motion of the atoms and molecules of the brain as fundamentally different from thoughts and feelings. The difference is so radical that no knowledge of the constitution of the human body, however precise and exhaustive, could, of itself, yield any clue whatever to the existence of modes of consciousness connected with it. Even if the brain of a man "could be so enlarged that all the members of an International Congress of Physiologists could walk about inside his nerve fibres and hold a conference in one of his 'ganglion cells,' their united knowledge and the resources of all their laboratories would not suffice "[1] to enable them to discover a feeling or sensation or perception or idea or belief or anything which can properly be called a mode of consciousness or a mental fact. In particular, they would utterly fail to discover any connection of brain-states or processes with each other bearing the most distant resemblance to that unity of individual consciousness which can be expressed only by saying that different modes of consciousness are owned by the same self or "I."

[1] This illustrative hypothesis is borrowed from Mr. McDougall, *Body and Mind*, p. 352.

On the other hand, it is equally clear that no examination of mental facts could ever suggest that a conscious individual is a material thing, or yield any knowledge concerning material occurrences. No scrutiny of modes of consciousness can reveal the existence of a brain or its anatomical constitution or the processes which take place in it. Information on this point is first acquired when the skull is opened so that the pulpy mass within it can be seen and felt. Apart from this, conscious individuals might have thought, felt, and willed and known about themselves and each other without ever suspecting that they had brains at all.

It thus appears that even if the being which is a mind is also supposed to be a body, yet the mental aspect of its nature is so distinct from its bodily aspect that each requires separate and independent investigation. Knowledge concerning the mind does not of itself include or conduct to knowledge concerning the body as such. Knowledge concerning the body does not of itself involve or conduct to knowledge concerning the mind as such. Hence Physiology and Psychology are radically distinct sciences, each dealing with its own proper subject-matter. As each advances independently, it becomes increasingly possible to compare their results, so as to determine how purely physiological facts and purely psychological facts are related to each other. There thus arises a borderland science, which is called Physiological Psychology. In this science Physiology and Psychology co-operate, and both receive from it light and guidance in their own special domains.

It must not be supposed that because I have discussed the implications of the view that the being which is a mind is also a brain, I therefore mean to endorse it. There is a strong case, based on the results of Physiological

Psychology as well as on metaphysical considerations, for an alternative hypothesis according to which the subject of mental attributes has a distinct existence from the body or any part of it, and the relation between them is one of constant and intimate interaction and co-operation.[1] The point which I am here urging is that whatever view we may take on this question we must still recognise that there is a mind and not merely mental states and processes. Whether that which is a mind is or is not also a portion of matter is a further problem which need not be decided in our initial account of the province of Psychology.

§ 6. **Mental Dispositions.**—We now pass to a very important question. Does what is mental merely consist in consciousness and its various modifications? Or does the constitution of an individual mind include also unconscious states and processes? In order to make this question intelligible we must at the outset fix on some criterion which shall enable us to distinguish between what is mental and what is not. The only possible point of departure lies in the definition of a mind as a conscious individual; whatever else we may regard as mental can only justify its claim to be so regarded through its connexion with conscious states and processes. It must be such that its nature cannot be conceived except as constituted by its relation to the life history of an individual consciousness.

It may help us to understand this better if we begin by considering an analogous case drawn from the scientific view of the material world. For the student of physical science matter is primarily what has extension, position, and motion in space. In particular material process

[1] This view has been brilliantly expounded and defended in Mr. McDougall's recent book, *Body and Mind*.

primarily consists in motion. But the student of physical science is constantly compelled to recognise other attributes, besides these, as belonging to the nature of matter. He has, for instance, constantly to recognise the existence of mass and energy. Under certain conditions a ball of gold is set in motion, and its motion has a certain velocity: under otherwise precisely similar conditions a ball of iron of the same size is set in motion; the ball of iron then moves more quickly than the ball of gold of exactly equal bulk. Its velocity is two and a half times as great. What makes the difference? The student of physical science can only say that it is somehow due to a difference in the nature of the two bodies, the ball of gold and the ball of iron. This difference he names a difference in their *mass*, and he says that the mass of the ball of gold is two and a half times as great as the mass of the ball of iron. Now the point to be noticed is that mass for the physicist is not anything positively and directly observable and describable like the actual motion of a body. It is only inferred from its effects, and it is conceivable only in relation to its effects. It is conceivable only as being that which makes a certain traceable and definable difference in the behaviour of bodies under otherwise similar conditions.

What the physicist calls *energy* is an entity of a similar type. A man carries a stone to the top of a hill. Inasmuch as he overcomes the resistance due to the weight of the stone, he is said to do work upon it; to do work is to overcome resistance. Now when the stone has been carried to the top of the hill it has thereby itself acquired a capacity of doing work equivalent to that which was done on it in carrying it there. If it is allowed to drop down the hill again it may break a man's head on the way and make a dint in the earth when it reaches the bottom; besides this, it also generates heat in colliding with or

rubbing against the objects which it encounters on its way. This capacity for doing work is attributed to the stone even while it is lying idly at the top of the hill. It is then called potential energy, or energy of position. What then is this potential energy?

It is not anything positively observable or imaginable like shape, position and motion. It is conceived only either as the mere possibility of a body or system of bodies doing work, or as being something, otherwise indefinable, on which this possibility depends. We need not here stay to discuss which of these alternatives is the right one. But it is important for our purpose to note that whether or no energy is a mere possibility, the student of physical science is continually compelled to speak of it and think of it as if it were something actual. It is for him something which is continually being communicated from one body or system of bodies to others almost as if it were a fluid poured from one vessel into another. Further, on being thus transferred it is also transformed in its nature. It may assume the form of mechanical energy, electrical energy, radiant energy, magnetic energy, energy of molecular condition, or energy of heat. Further, in all its redistributions and transformations, it is regarded as constant in quantity. In all its redistributions and transformations it undergoes neither increase nor diminution.

Now in Psychology we cannot proceed without constantly recognising the existence of unconscious factors connected with consciousness in a way comparable to the way in which mass and energy are connected with motion. The general name for such unconscious factors is "mental dispositions." What is meant by a mental disposition may be illustrated by taking any case in which a previous experience contributes to determine the nature of a present experience. I meet a man to-day; I do not think of him

until I meet him again after the lapse of a week or a month. But when I meet him again my consciousness in relation to him is different from what it would be if I were then seeing him for the first time. In particular, it differs inasmuch as I recognise the man as being someone whom I have seen before. This is due to my having in fact seen him before. But my seeing him before is a transient mode of consciousness which ceased to exist, as such, a week or a month ago. How then can it exert any modifying influence on my present consciousness when I see him again?

Plainly, if my previous perception of the man, when it had ceased to exist as an event in my conscious history, had also ceased to exist altogether so as to leave no trace or vestige of itself behind, my present consciousness, when I see the man, would be just the same as if I were seeing him for the first time. We must, therefore, assume that in ceasing to exist as an actual mode of consciousness it has continued existence as a persistent condition of possible consciousness, or as a persistent possibility of consciousness which may come into operation to determine the actual course of my experience whenever a suitable occasion arises. The occasion need not, of course, be a fresh perception of the man. If he has been introduced to me by name, then when I hear the name a week after, in the absence of the man, the idea of him may thereby be recalled, including, perhaps, a mental picture of him. The mere sound of the name will not of itself account for this. It is necessary also to take into account the abiding after-effect of the previous experience in which I was introduced to the man.

By far the greater part of our mental acquisitions are owned by us as mental traces or dispositions and are not present in the form of actual consciousness. When a person is said to know mathematics or to retain in his memory

the events which happened a year ago, it is not meant that all the mathematical propositions which he knows or all the events which he is said to retain in his memory are actually present to his consciousness. He need not be supposed to be actually thinking of mathematics or the events of the past year at all. What is meant is rather that he is capable of recalling to mind the mathematical propositions or the past events when occasion arises, and also that these previous mental acquisitions contribute as occasion arises to influence in other ways the subsequent course of his conscious life history.

We may regard mental dispositions as constituting a sort of mental structure which is constantly being formed and modified by conscious process and is in its turn constantly contributing to determine and modify subsequent conscious process. "We are able to discover a number of general laws of this structure and (its) operation, and to describe how it gradually grows, every moment of conscious life leaving it altered in such a way that its influence upon later coming parts of the stream of consciousness is modified until its structure and its influence upon conscious life becomes exceedingly complex. But as compared with consciousness itself this conditioning factor . . . is relatively stable and unchanging."[1]

The onward flow of thought and experience depends in every moment of its course on the co-operation of an organised system of conditions which have indeed been formed in and through bygone conscious experience, but which are not themselves present in or for consciousness. Consider, for instance, the process of recollecting a name. The endeavour to recollect is a conscious process, but its success or failure depends on other factors. It depends,

[1] McDougall, *Body and Mind*, p. 165.

for instance, on the trace or disposition formed in the course of previous conscious experiences in which the name has occurred. Conditions connected with this trace or disposition determine whether the name will be recalled at once, or after prolonged effort, or not at all. It may happen that we fail to remember the name while we are trying to do so, and that it suddenly emerges into consciousness after an interval during which we have been occupied with other matters or have been asleep. This implies that our conscious effort to remember has set going an unconscious process which continues after the conscious effort has ceased and terminates in the actual emergence of the name into consciousness.

Now, what holds good in this instance of recollecting a name holds good generally throughout our mental life. Whether my thoughts come to me quickly or slowly, easily or with difficulty, they come to me only through the co-operation of conditions which are not discoverable by any analysis of my consciousness. My conscious activity is never the sole factor involved. It always appeals, so to speak, to something else and awaits the result, which may or may not be such as it requires.

Let us take two more illustrations. I happened recently to be talking to a friend about the Covenanters. He stated that in the novel *Old Mortality* Scott had said that the Covenanters "had nothing human about them except their walking on their hind legs." I expressed doubt as to the passage occurring in *Old Mortality*. My friend consulted the book but could not find the words in it. The next morning he came to me with the passage copied out. Some time after I had left him and after he had ceased to think of the topic we were discussing, he found himself turning to his shelves and examining not *Old Mortality* but Lockhart's *Life of Scott*. He then turned to the right

page and found what he was in search of in one of Scott's letters.

My other illustration is taken from the frequent experience of authors in the practice of literary composition. "My ideas," wrote Rousseau, "group themselves in my head with incredible difficulty: they move about obscurely, they ferment to the extent of upsetting me and giving me heart beats, and in the midst of all that emotion I see nothing clearly: I could not write a single word, I must wait." The same with Flaubert, "I am in a rage without knowing why; my novel, may-be, is the cause. It does not come, all goes wrong; I am more tired than if I had mountains to bear; at times I could weep. . . . I have spent four hours without being able to write a phrase."[1] The vague mental excitement in such cases involves complex processes taking place among psychical dispositions, and it is through these complex processes the final result is determined—the pages of lucid, definite and orderly words, sentences and paragraphs to be found in the books of these authors.

We may now briefly reply to three questions:—How do we know that mental dispositions exist? What are they? Why do we regard them as mental facts? We know of their existence through their effects, through their indispensable function as factors conditioning the flow of conscious life. In like manner mass and energy are known to the physicist only as being indispensable factors conditioning the motion of bodies in space.

To the question, What are they? it is sufficient to reply that their nature is defined for us by their function and their origin, by the way in which they condition the flow

[1] Binet, *Année Psychologique*, 1894, pp. 79 and 80. Quoted and translated by Jusserand, Proceedings of British Academy, 1911-1912.

of our conscious life, and by the way in which they are themselves produced and modified by conscious processes. The physicist can give only the same type of answer to the question, What are mass and energy? These are for him only entities which condition in certain definite ways the course of material process consisting in the motion of bodies in space. In metaphysics such answers might be regarded as unsatisfactory, for metaphysics aims at ultimate and complete truth. But psychology does not attempt to solve metaphysical problems. Its special province is merely to give a systematic account of the laws and conditions of the life history of individual minds.

As for our reason for classing dispositions as mental facts we may again refer to the analogous case of mass and energy. For the student of physics mass and energy are physical facts because for him their whole meaning and significance lies in their relation to material occurrences, the motion of bodies in space. Similarly, for the student of psychology dispositions are mental facts because for him their whole meaning and significance lies in their relation to consciousness and its various modifications. If the physicist were assured that energy is really something psychical, as it possibly may be, this piece of information would be irrelevant for him as a physicist. He would still for the purposes of physical science be bound primarily to regard it in its relation to material process, and therefore as itself material. It would not cease to be a material fact for him merely because he had reason to regard it as also a psychical fact. In like manner even though it were admitted that mental dispositions are also physical facts, they do not cease for the psychologist to be mental facts.

It is from this point of view that we must approach the doctrine that mental dispositions are in reality physio-

logical dispositions. It is true that there are physiological dispositions. Processes taking place in the brain leave behind them modifications of the brain substance which contribute to determine the nature and occurrence of subsequent brain processes. Such physiological dispositions are, of course, physical existences. They are so because they are conceived merely as resulting from material processes and as factors determining further material processes.

Now it has been held by many authorities that what we have called mental dispositions are really identical with physiological dispositions. The question here raised is logically the same as that with which we have already dealt in examining the view that the mind is really identical with the body. Even supposing that that which is a physiological disposition is also a mental disposition, yet these two aspects of its nature are so distinct that they can be examined separately and must be examined separately before we can proceed to investigate the relation between them.

Besides dispositions which arise as traces left behind by previous experience, there are also congenital predispositions, innate aptitudes and propensities. Some men, for instance, are born with a native bent for music, others for mathematics. Such innate endowments consist partly in an original capacity for feeling interested in certain directions, partly in original power of rapidly learning and firmly retaining what has been learned.

Differences of congenital equipment are very evident when we compare with each other animals belonging to different species. The special interest which a kitten, without previous relevant experience, shows in a dangling ball of worsted is totally absent in the case of a rabbit. The propensity and ability of a starling to imitate sounds is not found in the canary. "The twilight which sends the

hens to roost sets the fox to prowl, and the lion's roar which gathers the jackals scatters the sheep . . . Out of all the manifold changes which a given individual experiences only a few are the occasions of such decided feeling as to become possible objects of appetite and aversion."[1]

What special experiences have this exciting effect depends primarily on congenital predispositions.

[1] J. Ward, article on "Psychology," *Encyclopaedia Britannica*, 11th ed., Vol. 22, p. 552.

CHAPTER II.

The Data and Methods of Psychology.

§ 1. The Basis of Psychology in Pre-scientific Knowledge.—All the special sciences grow out of the common matrix which is supplied by that ordinary pre-scientific knowledge of the world which we call common sense—the knowledge possessed by the "plain man" or "the man in the street." They are special developments of that practical acquaintance with things and their behaviour which is acquired by all of us in the course of daily life. Psychology is no exception. It has for its primary basis the pre-scientific knowledge which we all of us possess of what passes in our own minds, together with that knowledge of what passes in the minds of our fellow-men on which the possibility of social intercourse and social co-operation depends.

As members of society, we are constantly gathering and seeking to gather from the outward behaviour of other members of society, from their gestures, attitudes, words, and actions, a knowledge both of their transient mental states and processes and of their more permanent mental dispositions—of their passing emotions, desires, thoughts, and volitions, and of their abiding and habitual ways of thinking, feeling, and willing. In this manner each of us acquires in ordinary social intercourse a knowledge of mental facts and laws sufficient for the practical purposes of our daily lives.

Such practical knowledge of mankind is not a knowledge of matter and material occurrence. It is pre-scientific Psychology, not pre-scientific Physiology. It is not a knowledge of what passes in human brains, but of what passes in human minds. It does not even pre-suppose that there are such things as brains. It is, essentially, a knowledge of mental facts which are not and cannot be seen, felt, or handled. What interests us in our fellow-men is not so much their bodily existence as the conscious life which is connected with their bodily life.

This pre-scientific psychology is not primarily introspective in its general tendency. The conscious individual does indeed to some extent take note of what passes in his own mind. But as his controlling interest is social, he is primarily concerned with the minds of others, and with himself only in relation to others. For all of us, the awareness which we ordinarily have of ourselves is inseparably connected with the thought of other selves as variously related to us in the way of social intercourse. As the social situation varies, there is corresponding variation in the self-consciousness of the individual. The schoolboy's view of himself differs according as he is in the company of his school-master, or his play-fellows, or his mother, or his little sister. Consider the change which passes over a man's self-consciousness when he finds his joke met by chilling silence instead of the anticipated peals of laughter. In general, as we see our own faces only as revealed in reflecting surfaces, so we think of ourselves, for the most part, as mirrored in other minds, and it is, primarily, the mental life of others rather than our own which engages our interest and attention. Deliberate introspection undertaken for its own sake is in general a comparatively late development.

There is, however, a difficulty which requires to be noticed

here. We must recognise that our only key to the mental life of others is ultimately to be found in our own. We cannot directly feel another man's emotions or think his thoughts. Hence our interpretation of his outward behaviour as meaning occurrences going on in his mind must ultimately be based on our own individual experience. In thinking of what passes in a mind other than our own we must apprehend it as more or less similar and contrasted with or otherwise related to modes of our own consciousness. We have, then, to reconcile two positions which may at first sight appear to conflict with each other: (1) That initially our knowledge of others develops in advance of our knowledge of ourselves. (2) That we can construe the outward behaviour of others as expressing their conscious life only on condition that we have ourselves lived through or are living through similar or related experiences.

The solution of this problem depends on a distinction which I have already referred to, the distinction between having an immediate experience and knowing or thinking about it. It is one thing to live our conscious life, it is another to take express notice of our modes of consciousness so as to recognise their nature, classify them, describe them, raise questions about them, or make judgments about them—even the judgment that they exist or occur. As I have already pointed out, when a man's attention is completely engrossed by its object, he does not attend to his own attention as he attends to the object. Similarly, to desire something is distinct and separable from reflection on the state of desiring. The same holds for all properly subjective modes of consciousness.

It might be supposed that this is otherwise with sensations, inasmuch as these are primarily objective. But it must be remembered that there are two ways of attending to sensations. We may attend to them as a necessary part

of the process of attending to external objects and their qualities and relations, or we may attend to them as being immediate experiences of the individual in contrast to what exists or occurs in the material world. Now initially our attention is given to sensations in the first way rather than the second. We are mainly interested in them, not as being modes of our own private experience, but as conveying information concerning the existence and nature of material things. And this remains our prevailing attitude to the end. When I see a horse or a tree I experience visual sensations, but I take note of them only in the act of attending to the horse or the tree. I do not usually reflect on my own sensations as immediate experiences. This is more likely to occur when I am observing the behaviour of another person. When, for instance, I see another man shivering while I am warm and comfortable, I contrast his feeling of cold and discomfort with my feeling of warmth and comfort under similar external conditions.

It is on this distinction between living our conscious life and *reflection* concerning it that the solution of our problem depends. In order that we may be able to enter into the experience of others, it is indeed necessary that we have similar or related experiences of our own. But it is not necessary that there should be a prior stage in which we reflect on these experiences, take note of them, name, describe, or analyse them.

Take, for example, an excited spectator of a game at football. His sympathetic excitement finds vent in movements of his own, imitative of those of the players. There exists in his mind an experience of activity corresponding to theirs and more or less like theirs. Through this experience he enters into theirs; he brings home to himself how they are feeling. But he is not at all attending to his own

mental states, as such, to his own immediate experiences. By means of these experiences he apprehends what is going on in the minds of the players. But he is not taking notice of what is going on in his own mind. Probably he is not even aware of his own imitative gestures.

This case may be taken as typical of what is primarily our normal procedure in taking cognisance of the mental processes of others. You see a man fall. You know more or less what he feels like in falling, because the sight suggests corresponding experiences of your own. But you do not go through the process of saying: "I feel in a certain way when I fall; this man is falling; therefore, he has corresponding experiences. He is a tall and heavy man; therefore these are more intense and in some respects different." Similarly, in reading a play or a novel you sympathetically follow the thoughts and feelings of imaginary personages; this you are able to do ultimately because you have had kindred experiences of your own; but it is not essential that you should previously have reflected on these experiences of your own, still less that you should expressly recall them and think about them at the time when you read the novel or see the play.

§ 2. **Presuppositions of Pre-scientific Psychology.**—The presuppositions on which the possibility of pre-scientific psychology depends are fundamentally the same as those on which scientific psychology depends. The data are ultimately of the same kind and they are used in fundamentally the same way. The difference is only the difference between common-sense knowledge and scientific knowledge. Scientific knowledge is a development of common-sense knowledge, distinguished by a more purely theoretical interest and by its systematic thoroughness and precision.

What then are the essential presuppositions of that

knowledge of our own minds and of the minds of others which each of us acquires in the course of ordinary life?

One necessary postulate plainly is that mental states and processes as they occur in individual minds exhibit a systematic order in conformity with rules of more or less generality, and that this order is uniform in different minds, varying only in its expression according to the varying conditions of special cases. We all in daily life expect that a person whom we have frequently and recently met will be able to recognise us when he sees us again. We anticipate that, in general, a man will be disagreeably affected if someone treads heavily on his toe or if he suddenly loses all his money. We assume that the persons around us are pursuing definite ends and in consequence are endeavouring to possess themselves of the means to those ends and to utilise such means. On every hand we find more or less permanent institutions which presuppose uniform and predictable behaviour on the part of large groups of human beings, *e.g.* the railway system, ships, post offices, colleges, churches, and business establishments of all kinds. Our whole social system presupposes that there is a systematic order more or less uniform in different individual minds, though variously manifested under varying conditions.

In the second place, it is an essential postulate of pre-scientific psychology that the mental states and processes of human beings are connected in a more or less regular way with their bodily behaviour. Thus, if we see a man going through the act of throwing a stone in a certain way into the water, we assume that he wants to make "ducks and drakes." If a person without any kind of compulsion, regularly attends a course of lectures we assume that he is interested. Our only means of gaining insight into the mental life of others is through interpretation of their

bodily actions, attitudes, and words. The logical presuppositions on which this procedure is based is that bodily behaviour is connected in a more or less uniform way with mental facts.

The two postulates which I have so far considered are similar in nature to those which underlie our knowledge of the material world. They merely require that the general principle of the uniformity of nature shall be applicable within the domain of psychical existence. But when we consider the special nature of the order which we seek to discover in the domain of mind, it becomes evident that this differs essentially from the order of the material world as such. The order of the material world is fundamentally mechanical; the order which pervades and unifies the life history of individual minds is fundamentally teleological. The material world is a world in space, and physical occurrences are through and through determined by spatial relations, and themselves consist in changes of relative position in space. But conscious individuals, as such, and the varying modes of their consciousness are not in space. The controlling concept by which we apprehend the unity of their life history cannot be that of space and spatial relations. It is rather that of the direction of mental processes towards *ends*. When we inquire why a person does this or that we are satisfied when we discover that he does it because he wants something either as an end in itself, or as a means to some further end.

§ 3. The Data and Methods of Scientific Psychology.—The data of scientific psychology are essentially of the same nature as those of pre-scientific psychology. They are obtained through the individual's reflective apprehension of what passes in his own mind and also through observing and interpreting the behaviour of others and in general their bodily as indicating their conscious life. What

distinguishes psychology as a science is that it carries out its researches in a far more precise, systematic, and thorough-going way than is needed for the purposes of daily life. In daily life knowledge is mainly pursued in order to meet practical needs. But it is the distinctive aim of science to elicit from its data principles of the highest possible generality and to exhibit these principles as connected with each other in a systematic unity.

For this purpose both introspection and observation of others must be carried out in a deliberate, methodical and systematic way, and must be throughout controlled and directed by interest in definite questions of theoretical importance for the advancement of the science as a whole. This leads to the use of methods of scientific experiment and to the attempt to obtain quantitative results wherever such procedure is possible and useful. It also leads to a vast extension of the range of inquiry so as to include the accurate study of young children, animals and uncivilised races; also to the study of abnormal mental conditions such as insanity or the hypnotic trance, or the deprivation of one or more of the senses. Further, in considering bodily life as evidence of mental life, scientific psychology has to take account not only of obvious external behaviour, but also of the internal constitution of the body and its processes as revealed to physiological research; in particular, it has to take into account the anatomy and physiology of the sense-organs and the nervous system.

We have to consider separately the two ways of acquiring psychological data: (1) by self-examination, and (2) by observation of others; we have also to say something about the nature and use of scientific experiment and of quantitative methods in Psychology. But before proceeding to these topics it will be an advantage to draw attention to a point of great significance for our whole

view of the nature of psychological data, the fact that these data include not only subjective states but also, as inseparable from these, their objects, *as such*.

§ 4. **Objects as Data.**—To understand this, it is necessary to bear in mind the psychological use of the terms *object* and *objective*. Whatever any conscious individual means or intends to refer to is an object for that individual at the moment at which he means or intends to refer to it. This is so, independently of the question whether the object really exists or what kind of reality belongs to it. A man dreams that he sees a blue horse. There is no blue horse really there; and it follows that he cannot really see one. Nevertheless, the sensations and other conditions of his dream irresistibly impel him to think of a horse being actually present; and the presence of the horse, so far as he thinks of it, is an object for him, in the psychological sense. If he does not know that he is dreaming, he will in all probability not only think of the horse being actually present, but will also believe that it is so. It is an object not only of thought but of belief. If he becomes aware that his dream is only a dream while it is still going on, then, although the presence of the horse continues to be strongly and vividly suggested by his dream-imagery, he no longer believes but rather disbelieves in it. It is an object of thought and of disbelief.

Now objects in this sense form always an essential part of the data of Psychology. In describing a mind at any stage of its development, it is not enough to say that it has perceptions, conceptions, beliefs, hopes, fears, desires and other immediate experiences; we have also at the same time to specify the objects which in these various ways it is occupied with; we have to specify what it is that is present to its consciousness when it perceives, con-

ceives, hopes, fears, believes, and so on. "I don't know," says J. M. Barrie, "whether you have seen a map of a person's mind." He then proceeds to indicate what a map of a child's mind would be like; and in doing so he gives nothing but a list of objects in the psychological sense: "there are astonishing splashes of colour here and there, and coral reefs and rakish-looking craft in the offing, and savages and lonely glens, and gnomes who are mostly tailors, and caves through which a river runs, and princes with six elder brothers, and a hut fast going to decay, and one very small old lady with a hooked nose. It would be a very easy map if this were all; but there is also first day at school, religion, fathers, the round pond, murders, hangings, verbs that take the dative, chocolate pudding day, getting into braces, threepence for pulling out your tooth, and so on."[1] Now this inventory, supposing it be correct, is a collection of data for Psychology; they are data for the solution of the problem:—How did these objects come to be objects for the child? How did they get into his mind?

An indispensable part of the answer is to be found in the fact that from his birth onwards he has been continually receiving sensations, due to impressions on his sense-organs. But this by itself is obviously quite inadequate. To account for the result there are also needed manifold mental activities and processes together with the deposit which they leave behind them in the way of mental dispositions and linked systems of dispositions, determining and preparing the way for new mental developments.

As a result of these activities and processes and of the dispositions which they gradually form, certain objects

[1] *Peter and Wendy*, p. 9.

have come to exist for the child's consciousness. It is for the psychologist to show, as far as he may, how this takes place. But in order to do this, he must start with the result as a datum. The criterion of his success in tracing the process is the success which he may meet with in accounting for the product.

Take an example, which is used for another purpose by Dr. Hutcheson Stirling. "When one morning the day broke, and all unexpectedly before their eyes a ship stood, what it was was evident at a glance to Crusoe. . . . But how was it with Friday? As younger and uncivilised, his eyes were presumably better than those of his master. That is, Friday saw the ship really the better of the two; and yet he could hardly be said to see it at all." . . . What to Crusoe was a ship "was to Friday only . . . . an amorphous blur, a perplexing, confusing, frightening mass of detail which would not collapse [into a definite unity] and become single and simple for him."[1] Here there is a difference in the object which exists for the consciousness of Crusoe and that which exists for the consciousness of Friday. Yet all other conditions are similar for both of them, except that their mental history has been different. It is for the psychologist to show how the dissimilarity in their past mental history results in a difference in the object presented to their consciousness under otherwise similar conditions. It is at least his business to do this so far as the result depends on general psychological laws, conditions and processes.

The mere consideration of objects is not of itself useful to the psychologist except in so far as it contributes to supply a clue to the psychical processes and conditions through which such objects have become present to con-

[1] *Text-book to Kant*, p. 54.

sciousness. Hence it is important to be able to compare different stages or phases in the development of the objective content of mind in the race and in the individual.

From this point of view philology and anthropology supply useful data to the science of mind. The products of thought are embodied in language, so that the comparison of the vocabulary and of the syntactic structure of different languages is a means of comparing different stages of mental evolution. The comparative study of the religious and other beliefs of primitive races has the same kind of psychological value, and the same holds good as regards their technical and artistic productions. Again, apart from any reference to historical order, we may compare the same object as it is presented to different minds, or to the same mind under different conditions. This course yields important results when we can assign definite circumstances on which the variation depends. Thus, by comparing space as it exists for persons possessed both of sight and touch with space as it exists for the blind, we may obtain valuable data for determining the part played by visual experience in the development of this perception. A flood of light is thrown on the conditions of mental development in general by examination of the cases of such abnormal individuals as Laura Bridgman or Helen Keller.[1] Under the same head come the data supplied by mental pathology, including cases of aphasia, psychic blindness, and so forth.[2]

[1] Laura Bridgman and Helen Keller were deprived almost from birth of the senses of sight and hearing; and yet both reached a high degree of mental development. For Laura Bridgman see Stanley Hall's article in *Mind*, O.S. iv., p. 149. For Helen Keller see *Mind*, O.S. xiii., p. 314, xiv., p. 305, and N.S. i., p. 574, ii., p. 280.

[2] *Analytic Psychology*, vol. i., pp. 9-11.

It should be borne in mind that a presented object as a datum of psychology need have no actual existence in the real world. The solid figure seen in the stereoscope is not actually present; but it is none the less suggested to the mind as if it were really perceived, and that is all with which psychology has any concern. Its real presence or absence is a matter of physical fact, not of psychical fact. Its absence is important for psychology only because it involves the absence of certain conditions which might otherwise be supposed to be essential to the presentation of solidity.

§ 5. **Introspection.**—To introspect is to attend to the workings of one's own mind and to our own immediate experiences in a more or less systematic way. Instead of merely perceiving or willing, we inquire how we perceive or will, or how we come to perceive or will. A man shows us a pretty chess problem and its solution. Neither his mental attitude nor ours is introspective while he is telling us about the problem. But suppose that he goes on to describe how he came to invent the problem, or how he came to discover its solution; he will then be describing the workings of his own mind. He will speak of his disappointment and perplexity, his renewed hopes, his despair when all possible ways appeared futile. He will perhaps tell us how the understanding of the whole problem flashed upon him suddenly with the key-move, every element in it then assuming its right place, so that his subsequent mental activity became smooth and easy. All this is introspection. Consider next an example from the sphere of practice. A general gives an important order, or a responsible statesman puts before the world a scheme of policy. Neither the general's order nor the statesman's scheme directly expresses psychical facts; but if the general begins to tell us how he was led to give the order, he

will, in all probability, describe the process of his own consciousness. He may tell us that his mind for a time oscillated between alternative lines of conduct; now one appearing better, and now the other. He may tell us that the state of indecision, where there was need for prompt action, became unbearable; and that he suddenly put an end to it by fixing on one definite decision, without any real conviction that it was the best. Or again, he may describe how the decision emerged gradually out of his previous hesitation, so that he awoke one morning with a clear conviction that a certain course was the right one.

Introspection is a special development of explicit self-consciousness. In this we may distinguish three stages.

(1) The mere transition from the objective to the subjective point of view, as when a man, previously engrossed in watching the waves beating on the shore, begins to notice that he is watching them. This is the most rudimentary stage of *explicit* self-consciousness. But even while the subject was wholly pre-occupied with an external object, we cannot affirm that he was without any kind of self-awareness. What we ought rather to say is that this self-consciousness was implicit. Himself watching the waves formed part of the whole of which he was cognisant before he expressly discerned it as a distinct constituent of the whole. It is this separate discernment of the self which constitutes explicit self-consciousness. When it occurs after a previous state of absorption in other objects, the self discerned does not appear as something quite novel which was in no way present to the mind before, as when something previously unseen enters into the field of vision, or a sound previously unheard reaches the ears. In general explicit awareness of self seems to be pre-conditioned by implicit awareness.

(2) The second stage of explicit self-consciousness

involved is reflective, but not scientific. In it questions are raised by the subject concerning the workings of his own mind, but without reference to any scientific interest. Such questions may take shape as follows:—Am I really convinced or have I a lingering doubt? Am I feeling only moral indignation or personal resentment also? Is my mind really made up to do this or will I hesitate when the moment for action arises? Am I feeling better? What put this idea into my head? Am I really enjoying this picture or only pretending to myself that I enjoy it, because it is generally praised?

(3) The third stage is introspection as a scientific method, directed towards the answering of questions of theoretical importance for the advancement of our systematic knowledge of the laws and conditions of mental process. *E.g.* Can I will to do what I am fully convinced is impossible? Can I by an exertion of will bring myself to believe this or that, when otherwise the evidence would not convince me? Can I at the same time be in a mixed state of pain and pleasure? Can I attend to two disconnected objects at once? Do ideas ever arise in my mind without being suggested by other ideas? What kind of mental imagery do I use in thinking?

Turning now to certain alleged obscurities, fallacies, and difficulties of introspection, we may note at the outset that these do not exist when the questions which it has to answer are made sufficiently broad and simple. There is no fallacy, obscurity, or ambiguity in the statement that when I have toothache I dislike it very much, or that I was afraid when I saw a white figure in a churchyard. There is no fallacy or ambiguity in the statement that feeling pleased is different from feeling displeased, or that when we are fully convinced that an action is totally impossible we cannot voluntarily determine to perform it. Facts of

this kind can be observed with ease and certainty by everyone. Now if introspection could only supply us with such simple and obvious data, it would none the less be of essential value. It would supply us with the general terms in which to describe mental process. The more precise determination of such process in detail might be hypothetical, and dependent on other data as the ultimate test of its correctness. To a large extent this is the case. In this respect psychology is on a footing with other sciences. If we ask for the actual observations of the process of the gradual modification of inherited characters on which the Darwinian theory was based, we find what appear very slender foundations of fact for a very large superstructure. There were the experiences of the breeder, and very little more. The real data which supported the weight of the theory consisted in the nature of the actual products which the process was assumed to explain,—the actual constitution of animal and vegetable species in their higher and lower forms.

The deliverances of introspection are not, however, limited to such simple and obvious issues as we have mentioned. Like all other modes of observation, it is capable of being immensely improved by systematic training and practice. The plain man, as Sidgwick calls him, has, as a rule, no permanent and absorbing interest in the workings of his own mind. His attention is mainly engrossed by other objects. Thus, the introspective attitude is unfamiliar to him. This unfamiliarity is the chief reason why he seems so helpless when called on to observe the finer details of his own mental operations. Like a person passing from full illumination into a dimly-lighted room, he can at first discern little; but in time his power of discrimination may increase. By repeating his observations again and again, and comparing them with each other,

he makes gradual progress. The result of previous observation becomes the basis of a new advance. This is of course in no way peculiar to introspection. A man who is only beginning to observe in a systematic way fine distinctions between tastes, smells, and colours, shows at first the same helplessness. Advance is made as the cumulative result of a series of successive efforts of attention, each paving the way for the next. It is indeed a commonplace that the practised observer notices at once what the untrained fail to see even when it is pointed out. But besides individual practice there is yet another element in the training of the introspective psychologist. He derives immense help from the work of his predecessors. They teach him what to look for, and how and where to look for it. Thus what the introspection of one generation has achieved becomes the starting-point for fresh progress in the introspection of the next. The advance that has actually been made in this way is immense.

Nevertheless, it must be admitted that there are certain drawbacks attaching to the introspective process which cannot wholly be overcome even by sustained practice and systematic training. The most important drawback is that the mind in watching its own workings must necessarily have its attention divided between two objects, —on the one hand, the mental operation itself which is to be observed, and on the other, the object to which this mental operation is directed. If I observe the process of seeing, I must attend at once to what is seen, and to the seeing of it. If I notice what takes place in attending, I must both attend to something and also to the fact that I am attending to it. Thus if the introspective effort is sustained and strenuous, it is apt to destroy the very object which it is examining. For, by concentrating attention on the subjective process, we with-

draw it from the object of that process, and so arrest the process itself. Thus, introspection, when it is directly concerned with a mental operation that is in itself more or less absorbing, can only proceed by taking a series of transient side-glimpses. This difficulty is, however, not so serious as it appears; for, in the first place, retrospection is to a large extent free from it. By calling up a process in memory immediately after it is over we are often able to notice much that escaped us when it was actually going on. In like manner the astronomer can call up in memory the image of a star which has just passed before his vision; and can then notice details which had escaped him at the moment of its actual appearance. In the next place, we must bear in mind that it is not the isolated observation which is of importance in introspective psychology, but rather the accumulation of a vast number of observations, each helping the others. Thus, what is important is to acquire a general habit of alertness, a perpetual readiness to attend to the workings of our own minds whenever opportunities present themselves; and it must be noted that opportunities are constantly presenting themselves; the subject-matter which we have to observe is perpetually with us. This may be set down as a grand advantage of introspection, compensating in a high degree for its drawbacks. Finally, introspection, to be effective for the advancement of science, must, like other modes of observation, be carried on by a number of experts in co-operation. Each must communicate to the rest his own results, for confirmation or rejection. Thus, it is an essential part of his business to state his results in such a form that they can be tested by others. He must be able to point out to others exactly where and how to look for what he himself has observed. This is most easy when the method of experiment, as distinguished from mere obser-

vation, is followed, and constitutes one of the main advantages of that method. Of course, what is true of one individual, A, may not hold good of another, B; and B's inability to confirm A by his own experience should deter A from setting down as true for all men, or most men, what holds good only for some persons, possibly only for himself.

The peculiar difficulties of introspection, it should be noted, are mainly confined to the case in which what we attempt to observe is a subjective state or process, such as attending, willing, desiring or believing. The scrutiny of the nature and behaviour of sensations is usually also regarded as introspection. But it is not beset with the same difficulties. The reason, of course, is that sensuous presentations are themselves primarily objects. Besides, the dependence of actual sensations on appropriate stimuli makes it possible to fix and detain them or to repeat them at will by controlling their physical conditions.

Hence the examination of sense-experience is comparatively easy, and readily yields definite and trustworthy results. On this account there is a tendency in some psychologists to ignore or overlook the more evasive subjective states and to recognise only sensations and images as mental facts. This sensationalist bias is natural; but it results in a fundamentally false view of mental life, and we must always keep on our guard against being misled by it. It has been named by Dr Ward "presentationism."

§ 6. **Manifestations of Mental Process in Others.**—No one can directly observe what is passing in the mind of another. He can only interpret external signs on the analogy of his own experience. These external signs always consist in some kind of bodily action or attitude. Thus, when a man clenches his fist, stamps, etc., we infer that he

is angry. When a dog wags its tail, we infer that it is pleased. The knowledge acquired in this way must be carefully distinguished from the verbal description an individual may give of his own mental state. When a man tells us that he is or was angry, he is not directly expressing his anger, but his knowledge of his anger. He is conveying to us the result of his own introspection. This source of information is in no way peculiar to psychology. It does not differ from any other communication of observed facts by means of words. What we here especially refer to is the interpretation of signs which may or may not be noticed or understood by the subject who displays them. It may happen that the inference from the direct expression of the mental state may contradict the subject's own assertion about it. He may show most unambiguous symptoms of anger, and at the same time declare vehemently that he is not angry.

In the case of the lower animals and young children, it is impossible, and in the case of savages it is difficult, to obtain verbal descriptions of their own mental states and processes. This is partly because they either do not use language, or use a language inadequate for the purpose, and partly because they are not introspective. Under such conditions our only course is to rely on the interpretation of the appropriate external manifestations of their mental life. Interpretation becomes more difficult in proportion to the difference between the mind of the psychologist and the mind which he is investigating. The interpretation must rest on some analogy between the two. But if the analogy is only partial and accompanied by great diversity, a constructive process is necessary, requiring critical reflection on the nature of the problem and the data. It is in his own mind alone that the psychologist has the constituent elements from which an interpretation can be

framed. "All depends on accurate resolution of his own complex consciousness into its constituents, and on re-compounding these in such a way and in such proportions as to explain the nature and order of the signs which indicate to him the mental processes of others."[1] For instance, he finds among savages a wide-spread belief in the power of all kinds of irrelevant occurrences to influence the fortunes of the person to whom they occur. This is a prevailing tendency of savage thought; if the psychologist looks for analogies in his own mental life, he will find them few and far between. But they are not likely to be wholly absent. There are moments in which he either has been influenced or has felt strongly inclined to be influenced by considerations in themselves as meaningless as those on which the savage relies. The fall of a picture, or the spilling of salt, or the presence of thirteen at table, may make him uneasy in spite of reason. If he has ever been carried away by the gambling impulse, he must have been almost irresistibly prompted to regard quite irrelevant details as having an essential bearing on his winning or losing. In order to construct the mental state of a savage, he must carefully observe and analyse these transient and occasional mental attitudes in which he approximates to savagery. He must then attempt to represent a mind in which tendencies that, in him, are so overborne by other conditions as to be transient and occasional, are unchecked by opposing forces, and for that reason prominent and permanent. It sometimes happens that a man is so destitute of a certain kind of mental tendency himself that he is unable to understand its presence in others. Thus, Charles Lamb tells us that his friend George Dyer could never be brought to say anything in condemnation

[1] *Analytic Psychology*, vol. i., p. 15.

of the most atrocious crimes, except that the criminal must have been very eccentric.

The besetting snare of the psychologist is the tendency to assume that an act or attitude which in himself would be the natural manifestation of a certain mental process must therefore have the same meaning in the case of another. The fallacy lies in taking this or that isolated action apart from the totality of the conditions under which it appears. It is particularly seductive when the animal mind is the object of inquiry. The economy of a bee-hive displays such adaptation of means to ends as to suggest far-reaching prevision and political faculty of a human kind in the bees. But it would be very rash to trust this first impression. We must first consider all the other actions of bees and similar insects; we must also examine in detail how the individuals concerned severally perform the separate acts which in their combination constitute the orderly scheme of organisation of bee society. We shall then find that the most essential modes of behaviour, especially on the part of the queen-bee, are due to congenital tendencies, which operate independently of previous experience. We must further take into account the physical organisation of the bees. Their nervous system differs so widely and in such a manner from the human as to make us hesitate before ascribing to them so very large a share of processes especially characteristic of human beings. Finally, we find that the division of labour which makes the bee community possible is directly determined by congenital differences of physical organisation. The queen-bee, the worker, and the drone differ not only in their actual behaviour, but in their bodily constitution. The bodily constitution is so pre-arranged by nature as to be adapted for certain special functions. Here all analogy with the political organisation of human beings breaks

down. This is a typical instance. The lesson to be learnt from it is that in investigating the mental conditions of persons or animals widely removed in their general circumstances and conditions from our own we must assume an attitude of critical suspense until we have taken into account everything which can have a bearing on the problem.

This warning is the more important because human language is especially constructed to describe the mental states of human beings, and this means that it is especially constructed so as to mislead us when we attempt to describe the workings of minds that differ in any great degree from the human. The very implications of the words we are almost compelled to use in describing what we suppose to go on in the mind of a dog or a cat surreptitiously introduce interpretations which may be quite false and often are so. It is therefore above all things necessary in these cases to criticise our language, avoiding popular phraseology, and substituting technical terms with fixed meanings carefully defined. A horse, having had a feed at a certain place on one day, stops of his own accord at that place on the second journey. People say that it remembers being fed there before, and infers that it will be fed there again. In all probability these words with their human implications are quite misleading. Suppose that the driver of the horse is a bibulous person, who takes a drink as a matter of course whenever he comes to a public-house on the road. In order to do this he need not go through the process of explicitly remembering that he has had a drink at a public-house before or of inferring that he can have a drink at a public-house again. He simply has a bias to stop at a public-house whenever he comes to one. Probably the horse's act implies just as little of remembering or inferring.

§ 7. **Experiment and Observation.**—To experiment is to observe under conditions which we have ourselves pre-arranged. The pre-arrangement is intended to simplify the issue that is to be decided, by excluding irrelevant conditions, and by variously modifying and combining those which are relevant. In this wide sense psychology has always been to some extent experimental. What is especially modern is the introduction of apparatus and of exact measurement, such as are employed by the physical sciences. Experiment may be used in connexion with any of the modes of observation which we have described. It generally involves more than one of them, and often all three. The primary question may be, what kind of object will be presented under certain assignable conditions? A simple illustration is afforded by the old Aristotelian experiment of holding an object between the second finger and the forefinger of the hand, not in their usual position, but with the second finger crossing backwards over the forefinger. Under these circumstances, there often arises a perception of doubleness, so that we appear to be touching two distinct objects instead of one. Here the question is, what object appears to be perceived under the given conditions? Is it single or double? We may also put a question to introspection proper, and ask how far our mental attitude resembles that which exists in ordinary cases in which two objects are perceived by touch, *e.g.* when two opposite sides of the same finger are touched. In my own case, for instance, I find that when two opposite sides of the same finger are touched, the appearance of doubleness is more definite and unmistakable. With the crossed fingers there is a certain sense of strangeness and hesitancy which is absent in the ordinary perception of doubleness. Another case in which the primary question relates to the presented object is that of

the stereoscope. Here the conditions of perception are pre-arranged by means of a special apparatus, and the question is, what, under these conditions, is the nature of the object apprehended? Here, too, the introspective inquiry may be also raised, if we ask whether our apprehension of the object is direct or due to a process of inference. It is also possible to make experiments in which the primary issue is introspective. Thus, we may attempt to will something which we know to be impossible, in order to find out whether we *can* do so or not. Or again, we may deliberately attempt to attend simultaneously to two disconnected objects, with the view of discovering whether attention can be so divided.

Finally, we may experiment on the connexion between a mental state and its bodily manifestation. In this way, it is possible to discover many subtle signs and symptoms of mental process which evade ordinary observation. For instance, variations in the circulation of the blood, and in respiration, and in muscular power, accompanying various phases of emotion, may be accurately measured by physical apparatus. In principle, this kind of experiment often occurs in ordinary life. Whenever we say a thing or do a thing to a person, in order to see how he will take it, we are performing a psychological experiment.

It is clear that the experimental method does not disclose any essentially new source of psychological data. It is only observation under test conditions, deliberately prearranged for the purpose of settling a definite question. It is not quite accurate to define it merely as observation under test conditions. For test conditions may arise in the ordinary course of things, without any deliberate prearrangement on our part. All pathological cases come under this head. In such cases as those of Laura Bridgman or Helen Keller we have an opportunity of observing,

under test conditions, what the sense of touch alone can effect, in the absence of sight, hearing, smell, and taste. But the test conditions are such as could not be prearranged by the psychologist. He is not permitted to make people blind and deaf from their birth in order to watch the consequences.

The experimental method has often great advantages; but it has also certain drawbacks. The very conditions which we wish to investigate are often such as occur only in the normal course of mental life, and are interfered with by artificial arrangements. For instance, experiments on the association of ideas labour under this defect. The question which interests us is how the succession of ideas is determined in ordinary thinking. But experiment subjects the mind to conditions which are quite remote from those of the normal flow of thought. In experiment, isolated words or other objects are successively presented to a person, and he is called on to name the first idea which each of them suggests to him. Thus, continuity of interest, which is all-important in ordinary thinking, is excluded. Another question in which the experimental method is seriously defective is that relating to the mental imagery accompanying the use of words. When we deliberately select a word, and ask ourselves what imagery it calls up in our minds, we are by the very process of our inquiry interfering with the result. We are looking for mental imagery, and we have no right to affirm that the imagery which we find would be present if we had not been looking for it. The only safe course in such a case as this is to cultivate the habit of watchfulness, so that we may frequently catch ourselves in the act of using words in a natural manner in the ordinary course of thought. This perpetual readiness to notice what is taking place in our own minds, without deliberately resolving to do so, on this or that

special occasion, is at once a most difficult and a most necessary equipment of the introspective psychologist.

The special function of the experimental method has been well stated by one of its most enthusiastic advocates, Professor Titchener. "An experiment is a trial, test, or observation, carefully made under certain special conditions: the object of the conditions being (1) to render it possible for anyone who will to *repeat* the test, in the exact manner in which it was first performed, and (2) to help the observer to rule out disturbing influences during his observation, and so to get at the desired result in a *pure* form. If we say precisely how we have worked, other investigators can go through the same processes, and judge whether our conclusions are right or wrong; and if we do the work in a fitting place, with fitting instruments, without hurry or interruption, guarding against any influence which is foreign to the matter in hand, and which might conceivably alter our observation, we may be sure of obtaining 'pure' results, results which follow directly from the conditions laid down by us, and are not due to the operation of any unforeseen or unregulated causes. Experiment thus secures accuracy of observation, and the connection of every result with its own conditions; while it enables observers in all parts of the world to work together upon one and the same psychological problem."[1]

§ 8. **Quantitative Methods.**—A science becomes more exact in proportion as it deals with exactly measured quantities. Of late years, a strenuous effort has been made to measure the duration and intensity of psychical process. What are called reaction-time experiments are intended to measure the duration of simple mental operations. "It is agreed between two persons, the 'experimenter' and

[1] *An Outline of Psychology*, p. 35.

the 'reactor,' that on the occurrence of a certain sensory stimulus[1] (given by the experimenter) a certain movement shall be made (by the reactor)."[2] The time elapsing between the occurrence of the sensory stimulus and the execution of the movement in response to it is accurately measured. The responsive movement may follow at once upon the becoming aware of the effect of the stimulus, or "be restrained until certain connections have been formed in consciousness. In the former case, we speak of a *simple*, in the latter, of a *compound*, reaction."[3] The simple reaction has two forms, the muscular and the sensory. "In the muscular, ... the reactor is directed to hold his attention from the outset upon the movement which is to be made in response to the stimulus."[4] In the sensory, "the reactor is directed to hold his attention from the outset upon the sensory stimulus, and to withhold the reaction movement until he has sensed that stimulus."[5] One result of these experiments is that the muscular reaction occurs in a distinctly shorter time than the sensory. When the attention of the reactor is fixed in preparation for a coming sensation, he waits until he is distinctly aware of the presence of the sensation before reacting. On the other hand, in the muscular reaction, the reactor, being pre-occupied with making ready for his own reaction, need not wait till he is fully aware of the presence of the sensation. Hence he becomes with practice able to react before he has any distinct consciousness of it. The stimulus, as soon as it begins to operate, produces simultaneously sensation and reaction. The time taken by the simple reaction varies according to the nature of

[1] Such as the sound of a falling body. A sensory stimulus is a stimulus acting on an organ of sense such as the eye or the ear.

[2] Titchener, *op. cit.*, p. 319.

[3] *Ibid.*, p. 320. [4] *Op. cit.*, p. 325. [5] *Ibid.*, p. 323.

the stimulus. The sensorial reaction to light lasts about 270-thousandths of a second. A thousandth of a second is symbolised by the Greek letter σ. The muscular reaction to light lasts 180σ. The sensorial reaction to sound lasts 225σ, and the muscular 120σ. The sensorial reaction to pressure lasts 210σ and the muscular 110σ.

Accuracy of measurement is secured by special apparatus. An electric clock or chronoscope, as it is called, marks thousandths of a second. The production of the stimulus sets this clock going. The finger of the reactor all the time rests lightly on a button. The movement he makes by way of reaction consists in a slight pressure on this button, which immediately stops the clock.

In the compound reaction, various complications are introduced. The reactor may be called on to discriminate between two sensations, reacting only to one of them. Thus he may be told "that he will be shown either black or white, and that he is to react when he has cognised the black as black or the white as white; but he does not know which of the two brightness qualities to expect in each particular experiment."[1] In this case he knows that either white or black is to be looked for. The conditions may be further varied, so that he has no definite knowledge of the alternatives which are to be submitted to him, although he is expected to react on one of them, and one only. "Thus he may be told that he will be shown a light stimulus, and that he is to react when he has cognised this stimulus as a particular brightness or a particular colour; but nothing more explicit is said."[2]

The measurement of the *intensity* of psychical states is attended by peculiar difficulties, due to the intrinsic nature of the quantity to be measured. The degree of loudness

[1] *Op. cit.*, p. 328. [2] *Ibid.*, p. 329.

of a sound cannot be broken up into fractional parts which can be marked off from each other. We cannot say by direct comparison of two sounds that one is half, or a quarter, or a third, or twice as loud as the other. The two sounds cannot be superposed so as to make the fainter coincide with part of the louder, leaving a remainder which can be regarded as the quantitative difference between them. In this respect intensive differs from extensive quantity. The difference between two extensive quantities is itself an extensive quantity. The difference between two lines, one a foot long and the other ten inches long, is itself a line two inches long. But the difference between the loudness of two sounds is not itself a sound having a certain assignable loudness. "The difference between two intensive quantities, in fact, differs from each as much as the difference between two horses differs from a horse."[1]

Nevertheless, the attempt to measure intensive magnitude is not so desperate as it may appear. Clearly we cannot take one intensive quantity as the unit of measurement of others; but we may take as unit of measurement the difference or interval between *two* intensities. Suppose that we are considering, instead of two sounds, two pairs of sounds. Symbolise the one pair by A and B, the other by α and β. We find that we are able to judge whether the difference in loudness between A and B is or is not equal to the difference in loudness between α and β. Thus, if we have a scale of increasing gradations of intensity, we may take as our point of departure any given intensity in the scale. We can then arrange other intensities in relation to this, proceeding by intervals which we judge to be equal.

[1] B. Russell: "On the Relations of Number and Quantity," *Mind*, N. S. vi., p. 334.

By counting these equal intervals we can assign a numerical value to any intensity in the scale. The unit which is of most use is the least perceptible difference, viz. that difference between two intensities which makes it just possible for us to be aware that there is a difference at all. All least perceptible differences in the same class of intensities are regarded as equal to each other, because they appear equal when compared.

Instead of measuring psychical process, we may measure its external manifestations or conditions, and we may also measure the objects which are presented by means of it. As an example of the first kind of procedure, we may refer to the measurement of variations in the circulation of the blood, and in the action of the lungs, under varying phases of emotion and pleasant or painful feeling. The measurement of the presented object is of value when it can be brought into definite relation with varying conditions of presentation. A good example is supplied by recent attempts to measure certain geometrical illusions of visual perception. The following is a good illustration. Two lines in reality parallel are each intersected by slanting cross-lines, the cross-lines of the one being opposed in direction to the cross-lines of the other. The parallel lines are then not perceived as parallel, but as diverging in the direction in which the cross-lines would meet if produced, and converging in the opposite direction. Now, to measure the amount of illusion, we have only to substitute for parallel lines lines really convergent in such a manner and degree that they appear parallel under the same conditions. The degree of convergence required for this purpose measures the amount of the illusion. By this means it is possible to trace the variations which take place in the amount of the illusion with variations in the conditions. It is found to vary according to the number and obliquity

of the cross-lines. It exists in a fainter degree when the cross-lines merely meet the parallels without intersecting, or when they approach them without meeting. By establishing definite quantitative values for these varying cases

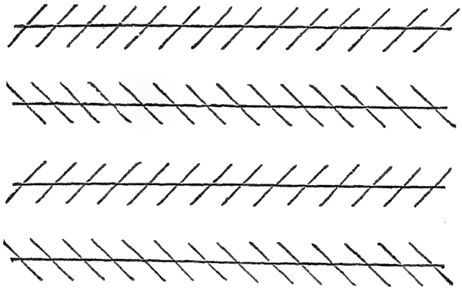

Fig. 1.

valuable data are supplied for discovering the process on which the illusion depends. Actual experiments of this kind of course require a specially contrived apparatus. The lines may be represented by moveable threads, which can be readily adjusted at will so as to be parallel or to deviate from parallelism in varying degrees, the deviation being accurately measured by a scale.

CHAPTER III.

BODY AND MIND.

§ 1. Bodily behaviour as conditioned by nervous and mental process.—The impressions made by external things upon our sense-organs constantly initiate responses in the way of bodily behaviour which are utterly disproportionate in their extent and complexity to the nature and limitations of the stimulus which provokes them. A light rubbing in a "tickly" part, for instance, may throw the whole body into convulsive movements, or the impression made on part of the sensitive surface of a man's eye when a gun is pointed at him may cause him to run behind shelter. What connects the impression on a small part of a small part of his body, the retina of his eye, with the movements of his leg and trunk involved in seeking shelter?

I may quote from Mr. McDougall an instance in which the disproportion between stimulus and response is still greater and more obvious. "A man receives from a friend a telegram saying, 'Your son is dead.' The physical agent to which the man reacts is a series of black marks on a piece of paper. The reaction outwardly considered as a series of bodily processes consists, perhaps, in sudden total and final cessation of all those activities that constitute the outward signs of life: or in complete change of the man's behaviour throughout the rest of his life. And all this

altered course of life, beginning perhaps with a series of activities that is completely novel and unprecedented . . ., bears no direct relation whatever to the nature of the physical stimulus. The independence of the reaction on the nature of the physical impression is well brought out by the reflection that the omission of a single letter, namely the first of the series (converting the statement into 'Our son is dead') would have determined none of this long train of bodily effects, but merely the writing of a letter of condolence or the utterance of a conventional expression of regret; whereas if the telegram had been written in any one of a dozen foreign languages known to the recipient, or if the same meaning had been conveyed to him by means of a series of auditory impressions or by any one of many different possible means of communication, the resulting behaviour would have been the same in all cases, in spite of the great differences between the series of sense-impressions."[1]

Plainly the stimulus does not of itself account for the resulting bodily behaviour. Between stimulation of sense-organ and ensuing movements there must be intermediate conditions and processes of a very complex and systematic nature, which, so to speak, translate the impression into expression. This mediating agency is certainly, in part, psychical. There is a mind which experiences a sensation, and this sensation, together with pre-formed mental dispositions, conveys to it a meaning of profound significance and interest, and it is this which determines and controls the ensuing behaviour of the body.

But this psychical factor, though essential, is not sufficient to explain what takes place. For bodily movement depends on the contraction of muscles, and muscles

[1] *Body and Mind*, p. 268.

are contracted owing to impulses which travel to them along nerve fibres: and these impulses, again, originate in immensely complex and systematic series of processes which take places in interconnected groups and systems of nerve cells; finally, these processes in the central nervous system are initially excited by impulses travelling along nerve fibres which pass inward from sense-organs to the central part of the nervous system. These impulses are like trains of gunpowder kindled by stimulation of the sense-organ, and giving rise to explosive disturbance in central nervous matter. From the point of view of pure physiology, all that can be ascertained as taking place is just this circuit or reflex arc of nervous occurrences, starting with stimulation of sense-organ, proceeding thence along incarrying or afferent nerves to the central part of the nervous system, to be there distributed and transformed in an immensely complex way, and finally drained off along outgoing or efferent nerve fibres to muscles, which are thus made to contract, and so give rise to bodily movements.

Our problem concerns the relation of this circuit of processes in the nervous system to the psychical factor—to the mind which experiences sensations, appreciates their meaning, and determines bodily conduct in accordance with its own interests and purposes, its continual striving after ends. How, we ask, is the purposive direction and guidance of bodily behaviour connected with its material conditions? This is the problem of the relation of body and mind.

Before proceeding to grapple with this question more closely, we may at the outset note two empirical facts of great importance. The first is that in human beings, at least, psychical process is primarily and directly connected, not with all nervous occurrences, but only with occurrences

taking place in a certain portion of the nervous system; it is primarily and directly connected only with that part of the brain which is called the cerebral cortex, and with certain closely connected nervous arrangements situated at the base of the cortex and constituting what is called the mid-brain. Sensations are experienced only when nervous impulses are conveyed to the cortex; movements expressive of will and intelligence take place only when they have their physiological origin in cortical processes.

The cortex is a sheet of gray matter, overlapping the other parts of the nervous system which are situated within the cranium. It is not distinguished from the rest of the nervous system by any essential differences except (*a*) the greater complexity of its organisation, and (*b*) that, to use a metaphor derived from the railway system, it is the central terminus of all main lines of nervous communication. When afferent nervous impulses have reached it from the sense-organs there are no further pathways for them except in the outward direction which leads to the muscles.

This then is the first point we have to notice—that primary and direct connection of mind and body is a connection only between mind and cerebral cortex. The second point is that other portions of the nervous system are capable of operating to determine bodily movements independently of the cortex. This is possible because, to recur to our railway metaphor, there are branch lines as well as main lines along which nervous impulses may be propagated.

The movements which arise in this way without the co-operation of the cortex, and therefore independently of conscious processes, are *comparatively* simple though in themselves they may be very complex. They are called reflex actions. Reflex actions are distinguished from those

which involve consciousness and connected cortical processes, by their fixity and uniformity; they are also distinguished from certain habitual actions which can proceed wholly or almost wholly without conscious guidance, such as walking or riding a bicycle or knitting, by another feature: unlike such customary actions, reflex movements have not been acquired by practice, but are provided for by the inherited constitution of the nervous system.

Reflex actions take place in a fixed and uniform way in response to an appropriate external stimulus. Without the actual presence of the stimulus they do not occur, and whenever the stimulus is applied they occur inevitably and invariably, unless they are interfered with by rival impulses due to another stimulus which tends to set the same group of muscles in contraction, or by fatigue and similar conditions, or by impulses proceeding from the cortex. When a speck of dust gets into the eye, movements of the eyelids ensue, which tend to get rid of the troublesome particle. The dust excites the afferent nerve-endings in the lining membrane of the eye; an impulse travels to certain groups of nerve cells situated in the head, and from these a reflected impulse travels back to the muscles of the eyelid. The cortex is indeed affected in such a way that a disagreeable sensation is experienced. But this cortical process and the concomitant sensation are not concerned in producing the movement of the eyelids. We cannot, indeed, by any effort of will wholly arrest this movement. Another example is the sneeze which follows the irritating effect of, let us say, cayenne pepper in the nostril or the convulsive jerks which follow the tickling of the sole of the foot.

The most striking illustrations are, however, furnished by experiments in which the cerebral hemispheres have been removed from the brain of an animal. "We may

perhaps broadly describe the behaviour of a frog, from which the cerebral hemispheres only have been removed, by saying that such an animal, though exhibiting no spontaneous movements, can, by the application of appropriate stimuli, be induced to perform all or nearly all the movements which an entire frog is capable of executing. It can be made to swim, to leap, and to crawl. Left to itself, it assumes what may be called the natural posture of a frog, with the fore limbs erect, and the hind limbs flexed, so that the line of the body makes an angle with the surface on which it is resting. When placed on its back, it immediately regains this natural posture. When placed on a board, it does not fall from the board when the latter is tilted up so as to displace the animal's centre of gravity; it crawls up the board until it gains a new position in which its centre of gravity is restored to its proper place. Its movements are exactly those of an entire frog, except that they need an external stimulus to call them forth. They differ, moreover, fundamentally from those of an entire frog in the following important feature: they inevitably follow when the stimulus is applied; they come to an end when the stimulus ceases to act. By continually varying the inclination of a board on which it is placed, the frog may be made to continue crawling almost indefinitely; but directly the board is made to assume such a position that the body of the frog is in equilibrium, the crawling ceases; and if the position be not disturbed the animal will remain impassive and quiet for an almost indefinite time. When thrown into water, the creature begins at once to swim about in the most regular manner, and will continue to swim until it is exhausted, if there be nothing present on which it can come to rest. If a small piece of wood be placed on the water the frog will, when it comes in contact with the wood, crawl upon it, and so come to rest. If

disturbed from its natural posture, as by being placed on its back, it immediately struggles to regain that posture; only by the application of continued force can it be kept lying on its back. Such a frog, if its flanks be gently stroked, will croak; and the croaks follow so regularly and surely upon the strokes that the animal may almost be played upon like a musical, or at least an acoustic instrument."[1]

§ 2. **Constitution of Nervous System.**—In all but the most primitive forms of life, what we call a living organism is in reality a society or community of living beings. The whole animal is ultimately composed of certain units called cells; a cell is the simplest particle of living substance which is permanently capable of independent life. Every cell is bathed in the fluids of the organism, the blood and lymph; these fluids form the environment which conditions its vital processes. It is continually taking up substances from this environment, submitting them to chemical transformation in its interior, and giving out other substances. This two-sided process of assimilation and dissimilation—of building up and breaking down—essentially constitutes the life of the cell; it is called *metabolism.*

The tissues of the body, *e.g.* muscular tissue, connective tissue, etc., are severally formed by the union of different kinds of cells. In particular, nervous tissue is constituted by the union of thousands of millions of specially differentiated cells called *neurons.* A neuron consists of a cell-body and of branching processes which issue from it. These branching prolongations of the cell-body are of two kinds, dendrons and axons. The dendrons terminate in the immediate neighbourhood of the cell-body, and

[1] *Text-book of Physiology.* By Dr. M. Foster. Sixth Edition. Part III., "The Central Nervous System," pp. 1000, 1001.

there divide and subdivide into minute twigs, forming what is called an arborescence. Axons are the essential part of nerve-fibres; they pass for a longer or shorter distance from the cell-body; in their course they send out here and there offshoots which are called collaterals. The main axon and each of its collateral offshoots severally terminate in immediate contact either with a sense-organ or a muscle or a gland or another nerve cell with its dendron. When they thus terminate, and not till then, they break up into an arborescence of fine twigs. The propagation of nervous impulses from neuron to neuron is made possible by this final arborescence of the axon or some collateral of the axon mingling with the arborescence of another neuron. The place where this takes place is called a synapse, or "clasping." It is the place where two neurons enclasp each other. The connexion is here intimate and complex. But it consists only in contact. The two neurons meet and embrace; but the substance of the one is not continued into the substance of the other. "The arborisations interlace and intermingle, and nerve impulses are transmitted from one nerve-unit to another, through contiguous, but not through continuous structures."[1]

In this way every part of the whole nervous system or community of neurons is directly connected with every other. Hence we may raise the question why it is that nervous impulses travel, as they normally do, along more or less definite paths instead of being indefinitely diffused through the whole system—through all the ways open to them—and so leading, not to definite and orderly movements, but to a convulsion of the whole body. As a matter of fact something like this does occur in cases of strychnine poisoning. The reason why it is normally

[1] Halliburton's *Handbook of Physiology*, p. 192.

otherwise is connected with the fact that at the synapse where nervous impulses pass from one neuron to another there is a certain resistance to be overcome. This resistance varies in degree for different synapses. Hence the wave of nervous disturbance finds its course barred in certain directions, and so is restricted to paths in which it meets with less obstruction.

In part it is the congenital constitution of the nervous system which determines the lines of least resistance. It is in this way that the course of the nervous impulses which give rise to reflex action is predetermined. But there is another condition of great importance which may be called the formation of nervous habits. This partly depends on the law of neural association, which is formulated as follows by Dr. McDougall: "The passage of a nervous impulse through a chain of neurons leaves that chain more or less permanently altered in such a way that its resistance to the passage of the impulse is in some degree diminished, so that a feebler excitement of the neuron at one end of the chain will thereafter be abler to propagate itself throughout the whole. Hence the more frequently nervous disturbance has passed through a certain group of neurons the more readily it finds its way through the same group again." Besides this law of diminished resistance, the formation of nervous habits probably also depends on another principle, long ago laid down by W. Carpenter; the principle that the nervous system "grows to the way in which it is exercised." The growth does not consist in the growth of new neurons. It consists rather in a further development of the processes which branch off from the cell-body, and meet in the synapses. The gradual formation of nervous pathways through habit is in the main confined to the cortex.

§ 3. **The Parts of the Nervous System.**—Within the whole nervous system we have to distinguish a peripheral part and a central part. The central part consists of the spinal cord and brain. The spinal cord lies within the spinal column or back-bone; at its upper end it passes into the head, where it broadens out into what is known as the *medulla oblongata* or "bulb." The other parts of the nervous system situated within the cranium are (1) the hind brain or cerebellum, consisting like the cerebrum of two hemispheres, and especially subserving the maintenance of equilibrium of the body as a whole in rest and in motion; (2) the mid brain, which includes the optic thalami and the *corpora striata*; this lies at the base of the cerebrum and is most intimately connected with it; (3) the cerebrum itself.

The peripheral part of the nervous system is that which connects the central part with other organs of the body, such as muscles, sense-organs and glands. We need here only concern ourselves with sense-organs on the one hand, and muscles on the other. The nervous system has the function of combining and regulating the activities of the other organs of the body. Accordingly, it is necessary, on the one hand, that it should be in communication with the muscles on which movement directly depends; on the other hand it is necessary that it should be brought into action by agencies at work in the environment, such as light, heat, sound, gravity, and mechanical pressure and impact. For this purpose, certain of the cells composing the body have been specially differentiated so as to be readily excitable in peculiar ways by such external agencies. Sense-organs are essentially constituted by groups of such cells peculiarly responsive in special ways to certain kinds of stimulus, those of the eye to light, those of the ear to sound, and so on.

The connexion between the central part of the nervous system and the muscular apparatus depends on nerve fibres which are essentially axons running from the cell-bodies of neurons situated within the spinal cord or the head to the muscles. Bundles of such fibres constitute motor nerves. The connexion with sense-organs is somewhat more complex. It is mediated not merely by nerve fibres but by entire neurons, including the cell body as well as its processes. For this office a special type of neuron is required. We have so far spoken only of neurons in which the cell-bodies branch off into many processes, one only being continued as an axon while the rest are dendrons. These are called multipolar neurons.

But there is another type of neuron which has only two processes, issuing from the cell-body in opposite directions, and both of them are virtually axons. Communication between the central nervous system and sense-organs is mainly mediated by these bipolar neurons. One axon and its collaterals pass to the cells of the sense-organ and finally "arboresce" round these. The other and its collaterals pass to nerve cells within the spinal cord or brain and finally arboresce round these. The cell body of the neuron may be situated either in the neighbourhood of the sense-organ or in the neighbourhood of the connected part of the central nervous system. Where the nervous impulses travel to the cord, as is the case for all those due to stimulation of the skin of the trunk and limbs, the cell-bodies are arranged in groups, called spinal ganglia, in close proximity to the cord itself. The places where bundles of axons from these groups of cells enter the cord are called the sensory roots of the spinal nerves. The places where bundles of nerve fibres issue from the cord to proceed to muscles are called the roots of motor nerves. A nerve is a bundle of nerve fibres.

Let us now turn again to the central nervous system and consider in rough outline the way in which its parts co-operate in determining bodily behaviour.

What we are mainly concerned with is the relation of the cerebrum to the other groups and systems of neurons. Here it is above all important to notice that the cerebrum does not *directly* receive impressions from sense-organs through afferent nerves, and that it does not *directly* send out motor impulses to the muscular apparatus. It operates and is operated on through the other parts of the nervous system. It uses lower groups of neurons as its instruments. Its place and office within the whole nervous system is analogous to that of the system as a whole in relation to the body. As the nervous system initiates, combines and coordinates the movements of the body, so the cerebrum initiates or arrests, combines or separates processes occurring in the spinal cord, the bulb, the cerebellum, and other groups of neurons.

One way in which this cerebral control may be manifested is in the partial or total arrest of reflex action which would otherwise take place owing to the independent action of lower nervous centres. This happens when we stop an inconvenient sneeze or cough or yawn. A good example is that of Cranmer holding his hand in the flames until it was consumed. Left to itself the spinal cord would have withdrawn the hand at once. This reflex was checked by nervous impulses arising from the cerebral cortex.

The cerebrum also controls lower centres in other extremely important ways. It may for instance isolate a movement which originally forms part of an inherited reflex action so as to carry out this movement by itself. "The motor co-ordination ancestrally provided for the ring finger gives an extending of it only in company with

extension of the fingers on either side of it. The isolated lifting of the ring finger can however, soon be acquired by training." [1] The isolated lifting then involves nervous impulses from the cerebral cortex controlling the action of the lower groups of neurons on which the reflex action depends.

Besides this separating or analytic function the cortex also constantly exercises a synthetic function. It combines and adapts, arranges and coordinates the relatively simple movements provided for by the reflex nervous mechanisms, so as to produce more complex modes of bodily behaviour. This takes place in the acquirement of such skilled actions as swimming, bicycling, skating, and the like. The combination of the movements of the legs and arms in swimming has to be learned; and the learning involves the formation of a neural habit, of a new habitual grouping of processes within the cortex. Similarly, the complex combination and coadjustment of the movements required for speaking a word depends on nervous impulse from a certain definite part of the cerebrum; but the simple movements combined and coadjusted in articulating the word are ultimately dependent on the reflex apparatus of lower centres.

This may be expressed by saying that other groups and systems of neurons are subsidiary to the cortex for all movements which are not reflex. Similarly, even for reflex actions of a comparatively complex nature, relatively lower centres are, in general, subsidiary to higher, *e.g.* the spinal cord to the bulb. This is frequently illustrated by comparison with the organisation of an army. The principal centre in the cerebrum "may be compared to the commander-in-chief. This highest officer gives a general

[1] Sherrington.

order for the movement of a body of troops in a certain direction; we may compare this to the principal motor centre of the cortex sending out an impulse for a certain movement in a limb. But the general does not give the order himself to each individual soldier any more than the cerebral cortex does to each individual muscle; the order is first given to subordinate officers, and their orders are given to their subordinates till in the end they are distributed to the individual men, who must move in harmony with their fellows both as regards time and place. So the subsidiary nerve centres . . . enable the impulse to be widely distributed by collaterals to numerous muscles which contract in a similar orderly, harmonious and coordinate manner." The like holds in the reverse direction for afferent impulses. "Just as a private in the army, when he wishes to communicate with the general, does so through one or several subordinate officers, so the sensory impulse passes through many cell-stations or subsidiary centres on the way to the highest centre."[1]

§ 4. **Empirical facts of the connexion between psychical process and cerebral process.**—Nothing which takes place in other parts of the nervous system is found to make any difference to consciousness except in so far as it gives rise to changes in the cerebral cortex and its annex the mid-brain; on the other hand, the suspension or alteration of certain cerebral processes appears uniformly to be accompanied by suspension or alteration of conscious process. Hence we may conclude generally that in the cerebral cortex, and the cerebral cortex alone, the conscious life of human beings is directly conditioned by neural occurrences.

This general doctrine is further defined and confirmed by the results of investigation into the localisation of

[1] Halliburton, *Handbook*, pp. 701 and 702.

cerebral functions. It has been discovered that a large part of the cortex can be mapped out into distinct districts, which fall into two classes. On the one hand, there are motor areas; each specially and distinctively the seat of nervous impulses which, passing directly to lower centres, finally reach certain definite groups of muscles, and consequently produce movements of a certain part of the body. On the other hand, there are sensory areas; these are only indirectly concerned in production of movement in so far as nervous impulses are propagated from them to motor areas. But each sensory region is distinctively connected with a special kind of sensation and the corresponding mental imagery.

Let us consider first the sensory areas. The general principle which determines their localisation is this:—The sensory area corresponding to a certain class of sensations is found in that region of the cortex where nervous impulses reach it from the appropriate sense-organ. The local separation of the parts of the cerebrum connected with different sense-experiences is founded on the "separateness of the incoming channels from the organs of sense."[1] Thus nervous impulses originating in the retina of the eye mainly reach the cerebrum in a certain part of the occipital lobe of the cortex: and it is here that the nervous arrangements are situated on which visual experiences depend. There is some reason for holding that this is again subdivided into two regions, one for sensations proper and the other for visual imagery—for those mental revivals of visual sensation which occur independently of actual stimulation of the eye.

The evidence for this separate localisation of an area distinctively concerned with visual experience is drawn from

[1] Sherrington, *Encycl. Brit.*, Vol. 14, p. 411.

many sources, including experiments on animals. We need only refer to the evidence gathered from cases of injury or destruction of this part of the cortex in human beings. Such injury or destruction, according as it is more or less complete, is accompanied by more or less complete failure of visual experience. "If the whole of the occipital cortex of one hemisphere of the cerebrum (say the left) is destroyed (as by the rupture of a blood vessel in that region) the patient suffers permanently the defect of vision known as hemianopsia, *i.e.* the optical impressions made on the left halves of both retinae no longer excite visual sensations; for the left halves of both retinae are connected directly only with the left occipital cortex. In rare cases in which the occipital cortex of both cerebral hemispheres is gravely injured, visual sensation, perception and imagination are almost completely destroyed; and though no case of the complete destruction of the occipital cortex of both hemispheres has been carefully studied, the evidence at present available is held by almost all physiologists to warrant the belief that in such a case the patient would be completely deprived of all power of visual sensation, perception and imagination."[1]

In close connection with this visual area there is a region which the study of diseases of language has shown to subserve especially the perception of written words as such. Injury to this part of the cortex may leave the power of vision in other respects comparatively unimpaired; but it abolishes the power of reading what is written or printed. The words are seen but they appear merely as marks on paper.

There is good evidence that more or less definitely circumscribed areas of the cortex are connected respectively

[1] McDougall, *op. cit.*, p. 103.

with sense experiences of smell and of sound. There is also reason for assuming that tactile and other skin sensations, together with other allied sensations which are due to the stimulation of afferent nerves coming from muscles, joints, and tendons, are specially connected with a region of the cortex situated immediately behind the motor areas and to some extent continued into these.

The motor areas themselves have been definitely ascertained. They are grouped together in what is known as the pre-central or ascending frontal convolution. From above downwards they are arranged in an order which in its main plan inverts the order of the corresponding parts of the body. First comes the area concerned with movements of the toes, then follow consecutively those for movements of the ankle, the knee, the hip, the shoulder, the elbow, the wrist, the fingers and thumb, the eyes, the ear, the eyelids, the nose, closure of jaw, opening of jaw, vocal chords and mastication. The relative size of the several areas is conditioned by the variety, delicacy and complexity of the movements they are concerned in producing, not by the size of the bodily organ with which they are connected. Thus the cortical area for the hand is larger than those for the whole abdomen and neck combined; that for the thumb is larger than that for the neck.

The part played by motor areas seems to be limited to the production and coordination of movements. It would seem that they are not directly connected with sensations or sensory images or with anything which is properly mental. It was once supposed that the outward discharge of nervous impulses from the cortex to the muscles was immediately connected with a peculiar kind of sensation, called "sense of effort" or "sense of innervation." But this view has been generally discarded.

A striking confirmation of the position that the motor

areas are not immediately connected with any sensation has been recently supplied by an experiment carried out by Dr. Cushing, of Baltimore. I have already mentioned that the cortical region subserving tactile and allied sensations is supposed to lie behind the motor areas and in their immediate neighbourhood. Now Dr. Cushing had two patients in whom both the motor region and the tactile region of the cortex were exposed. He found that by directly stimulating the several motor areas he could evoke corresponding movements of the body. But no sensations were felt except "those which accompany forced changes of position in the parts moved"[1] such as would occur when another person took them in his hand and moved them. "On the other hand, stimulation of the tactual areas produced no movements, but gave definite sensory impressions which were likened by one patient to a sensation of numbness, and by the other to definite tactual impressions."[1]

This experiment also disposes of the view that the motor areas are directly connected with the will. For enforced changes in the position of a limb, and the sensations which arise in consequence of such changes, certainly do not constitute a volition. A volition is the intention or determination to act, not the mere production of movement; otherwise all reflex action would be volition and we might regard the muscles themselves as the seats of will.

Only part of the cortex has been mapped out into sensory and motor areas with definitely localised functions. Of the rest we can only say that it consists of neurons and groups of neurons which supply, in immensely complex ways, lines of communication with each other and with the sensory and motor areas. Such portions of the cortex have been

[1] Halliburton, *op. cit.*, p. 729.

called "association centres." Their precise relation to conscious life is very obscure.

§ 5. **Scientific hypotheses concerning the relation of Body and Mind.**—In discussing the general relation of Body and Mind we must distinguish the purely scientific question from attempts at metaphysical explanation. From the merely scientific point of view, we have to determine what is the most likely hypothesis which can be gathered from interpretation and generalisation of the observed facts. Metaphysics finds that any view reached in this way involves difficulties and problems which require for their solution some theory concerning the ultimate nature of matter and mind and their relative place and function within the universe as a whole.

From the purely scientific point of view, two main hypotheses are current, the hypothesis of parallelism and the hypothesis of interaction. Parallelism is characterised by the uncompromising demand in dealing with the material world and its processes, that all factors, agencies, and conditions which are not themselves material are to be excluded. All motion and all redistribution of material energy must on this view be explained according to general laws as the result of previous motion and distribution of energy.

This principle is applied, not only to inorganic matter, but also to living organisms and, in particular, to occurrences within the brains of men and animals. Neurons and groups of neurons are simply portions of matter, just as a stone is, and the propagation of nervous impulses from neuron to neuron is as much a physico-chemical process as the burning of a candle. In explaining how a candle burns, science assumes that a complete account of what takes place can be given without referring to anything but the existence of material things and their

states and processes. Similarly, in explaining how nervous impulses are generated and propagated it is assumed that no condition comes into play except previous and simultaneous states and processes in the nervous system itself, in the rest of the body, and in the material environment.

Now if we suppose that in consequence of the agency of any immaterial existence or occurrence something happens within the cerebral cortex which would not otherwise happen in the same way as the outcome of purely material conditions, the unbroken continuity of physical explanation is destroyed. A factor is introduced as contributing to determine occurrences in the material world which is not itself material. But consciousness seems utterly heterogeneous in its nature from extension and motion in space. Hence, to introduce a conscious being, as such, in order to account for what takes place in the brain, is to introduce an immaterial factor in the explanation of material processes. The movement of striking a match is due to the contraction of certain muscles, and this again is due to the propagation of nervous impulses which have their commencement in the cerebral cortex. If we say that the cortical process is initiated or in any way controlled or modified by the desire to light a cigarette, we introduce a condition which is quite foreign to the order of the material world. Abiding by the point of view of physical science, we must say that the cortical process is traceable entirely to material conditions simultaneous with it and immediately preceding it. As for the desire to light the cigarette, we must say that this somehow arises in connection with the cortical process, and that wherever a cortical process, sufficiently similar, takes place, a similar conscious state comes into being. But we must not say that the desire, as distinguished from the brain events which accompany it, has any influence in determining the nature and course

of nervous impulses. So in general, every specific event constituting our conscious life is conjoined with a specific event in the flow of nervous process, and every variation and difference in the stream of consciousness is matched, according to uniform rules, by variation and difference in the course of brain events. But the relation is always merely simultaneity and concomitant variation. At no point does the conscious state intervene as an independent factor, so as to cause anything to take place within the cerebrum which would not otherwise have taken place owing to physical and chemical conditions operating according to physical and chemical laws.

Opposed to this hypothesis is that of interaction. According to this, conscious life is itself an independent factor which controls and modifies the course of nervous impulses so as to produce effects inexplicable by reference to merely material conditions. On this view, when my desire to light a cigarette is followed by the bodily movement of striking a match, this is not due merely to the brain processes which accompany the occurrence of the desire. It involves also the operation of the desire itself, controlling and modifying nervous occurrences, so that they follow a course which they would not have followed if left to themselves. The flow of events within the cortex and the consequences which follow from it are, according to the hypothesis of interaction, guided and directed by conscious interest and purpose so as to lead to the satisfaction of conscious interest and purpose.

On the contrary, if we accept the alternative hypothesis of parallelism, we must suppose the universe so constituted that nervous processes do this of themselves; we must suppose that without conscious control and guidance they of themselves take such a course as to minister to the ends of conscious life. We must suppose that the nebular

chaos was so constituted that a series of changes was bound to take place in it in accordance with physical, chemical, and mechanical laws, so that when I now desire to light a pipe my body meets my requirements by going through the movement of striking a match.

Let us now inquire what support these alternative hypotheses find in the facts ascertained by observation and experiment. Consider first of all the broad fact that conscious life proceeds only in immediate connexion with certain processes in the cerebral cortex, so that when these processes are abolished, say by inhaling chloroform, conscious life ceases. Plainly, events of this kind are open to alternative interpretation. They agree with the view that consciousness is merely a concomitant of certain nervous processes. But they also agree equally well with the view that these nervous processes are indeed indispensable conditions of consciousness, but not the only indispensable conditions. A proper supply of blood containing oxygen is necessary to the nervous processes themselves; without such a blood supply the metabolism in the cells of the nervous system cannot go on. But it would be absurd to argue that the blood supply is the sole condition of nervous metabolism and that the neurons themselves and their peculiar constitution have nothing to do with it, or that they themselves in their turn have no effect on the blood supply. Similarly, there may be a soul distinct from the body and interacting with it, although the conscious life of which this soul is the subject can only go on in connexion with certain nervous processes taking place in the cerebral cortex.

Nor is the state of the case altered when we take into account the ascertained facts of cerebral localisation. What follows from these facts is simply this: we cannot have certain experiences in the way of sensation and

sensational imagery, unless certain circumscribed areas of the cerebral cortex are excited. But it does not follow that no other condition is ultimately involved in the occurrence of sensations and images. The sensations and images are themselves utterly heterogeneous in nature from anything which takes place in the cortex; and this naturally suggests the presence of some other factor to account for their peculiar nature. From the point of view of physical science we look for no consequences from merely physical conditions except physical consequences. When therefore something comes into being radically distinct from any material state or process, it would seem that we must either treat its emergence as something totally mysterious and unaccountable from the scientific point of view, or postulate the cooperation of a factor which is not itself material.

Apart from metaphysical theories and explanations, the hypothesis of parallelism chooses the first alternative; it leaves the occurrence of consciousness and its modes totally mysterious and unaccountable. In one respect the facts of cerebral localisation enhance this difficulty, rather than relieve it. For they seem to show that processes may go on in the cortex otherwise similar to those immediately connected with consciousness, which none the less are not so connected. The evidence indicates that no conscious experience accompanies excitement of the motor areas. But the motor areas are just those which have been most precisely and accurately mapped out by the investigation of cerebral localisation.

It ought also to be borne in mind that the greater part of the cortex has not been connected with specially localised function. The results obtained, though remarkable in themselves and highly creditable to the acumen and industry of physiologists, are yet relatively very meagre.

They are limited to the recognition of certain areas especially connected with certain kinds of sensation and imagery. But our mental life is very far indeed from consisting wholly in sensations and images. There is also attention, interest, purpose, the persistent striving after ends, through trial and failure, reasoning, deliberation, voluntary determination, and so on. It is merely a very vague conjecture that these in their various special forms are immediately connected with special processes in special parts of the cortex. All that we know about other parts of the cortex, besides the motor and sensory areas, is that they consist of groups of neurons which serve to link the sensory areas with each other and with the motor areas.

If we ask why, on the interaction theory, conscious process should be indispensably conditioned by cerebral process, it is not difficult to find a plausible answer. For, on any view, the body is the medium of communication between the mind and the rest of the world, and the mind is in communication with other parts of the body only inasmuch as these are connected with the cortex. But it may well be that mental functions are throughout essentially conditioned by interaction between the mind and other things. Hence, it is natural that mental process should be uniformly conditioned by brain process.

It would seem that a general consideration of the empirical facts does not favour parallelism rather than interactionism. On the contrary, interactionism appears *primâ facie* to be the more natural and easy hypothesis. A more detailed examination of the conception of parallelism makes parallelism still more difficult. The theory is that every difference and resemblance between psychical states and events is regularly paired off with a corresponding difference and resemblance in contemporaneous cerebral

states and events. Now, if this be taken to mean that there is intrinsic analogy or likeness of nature between psychical fact and correlated physiological fact, parallelism cannot be maintained for a moment even as a suggested possibility.

It also breaks down utterly if it is taken to mean that important differences on the psychical side are matched by proportionately important differences on the physiological side. The qualitative difference between one colour-sensation and another cannot be matched by a difference between physico-chemical processes going on in the brain either similar in nature to the difference in the sense-experience or answering to it in the degree of its importance from the purely physiological point of view. All that parallelism can maintain is that there is *some* difference in the metabolism of nerve cells regularly paired off with the psychical difference.

The brutally empirical nature of the connexion is most evident when we compare the unity of the individual consciousness and the relation of the knowing and willing subject to objects known or willed, with any possible relations within the nervous system. What can be the physiological counterpart of the unity and identity of the conscious self and of its own awareness of itself as one and identical? Nothing like it is conceivable in the brain or in any part of the material world. Matter is infinitely divisible, and every portion into which it can be divided is just as much a distinct and independent material substance, just as much a separate parcel of matter, as any other. But the conscious self is not divisible into conscious selves. It is in the strictest sense individual or indivisible. When I compare a sensation of purple with a sensation of blue and apprehend their likeness and difference, the sensations are distinct, but my appre-

hension of them in their relation to each other is a single act, having a unique sort of unity to which there can be nothing at all similar in the material world. The utmost parallelism can maintain is that the unity of consciousness always accompanies a specially systematic and intimate connexion between certain groups of neurons. But this connexion cannot, from the nature of the case, be fundamentally different in kind from all other material connexions, as the unity of consciousness is fundamentally different from all other forms of unity. It cannot indeed be fundamentally different from other connexions within the nervous system which have no conscious correlate. For, in the last resort, such connexion consists merely in the propagation of a physico-chemical process from one neuron to another.

It is equally clear that the relation of the knowing or willing subject to its object cannot be paralleled by any possible relation between material things. I think of the civil war in China, or of the interpretation of $\sqrt{-1}$, or of the other side of the moon, or of my having voted yesterday in the town council election. These are the objects which I mean, to which I intend to refer. But when I thus mentally refer to $\sqrt{-1}$ as having an interpretation, obviously there can be no analogous relation of my body or the neurons of my brain to the root of -1. Material things may be near each other in space; they may causally interact with each other; but they cannot do anything like *meaning* or *intending* each other. The parallelist must content himself with saying that when I think of A, the process going on in my brain must be in *some* way different from what it is when I think of B.

Parallelism then, if it exists, must have a brutally empirical character. There is very little scope for the application of any intelligible principle which shall enable

us to determine what the nature of the nervous processes ought to be to which a given psychical process should correspond. This does not, of course, of itself destroy the conception of parallelism. But it may fairly be urged that its claim to rank as a probable hypothesis is somewhat damaged by such considerations. For the arbitrary character of the connexion strongly suggests that the concomitant variation of mental and cerebral facts is not an ultimate law of nature, but an empirical rule which requires to be explained by taking account of some other factor; and this other factor is just what the theory of interaction seems to supply by positing a conscious individual distinct from the body who is constantly influencing and being influenced by bodily occurrences.

In fact, parallelism owes its plausibility very largely to the assumption that in one respect at least there is a real and thorough-going analogy between mental and cerebral process, which enables us to regard their concomitance as the expression of an intelligible principle. It assumes that there is a real analogy and a systematic correspondence between neural habit and mental association—what in ordinary language we call association of ideas. As the sight or the idea of smoke calls up the idea of fire, through the conjunction of smoke and fire in past experience, so, it is held, the excitement of the group of neurons corresponding to the idea of smoke evokes the excitement of the group which corresponds to the idea of fire, owing to a nervous impulse having frequently passed between them in the previous history of the brain. This view looks plausible at the first blush. But as soon as we come to apply it in detail we encounter difficulties which threaten to bring us to a standstill. These are found (1) in the nature of mental associations, and (2) in the way in which motor habits are formed.

As regards the first point, the problem for parallelism would be comparatively simple if all mental association could be directly reduced to an association between sensations or mental images, as in the case of smoke and fire. Here the sight of smoke has frequently been conjoined either simultaneously or in close succession with the sight of fire. Hence we may say that the two corresponding groups of neurons having been frequently excited together, the resistance at their synapses has been lowered so that a nervous impulse in the one readily and rapidly spreads to the other. But by far the greater part of our associations do not exhibit this character. The only general principle which determines their acquisition is that they enable us to retain and call to mind, as occasion requires, such *objective* connexions as have aroused our interest and attention. It is relations of meaning, not mere conjunctions of sensations and sensuous images, which are all-important. These relations may be logical, mathematical, aesthetic, ethical; they may be abstract or concrete. The function of association is in all cases to enable us to retain the result of the mental work which we have previously gone through in discerning them, so that this work does not need to be done over again. When A suggests B through association, it is because A has been previously attended to as related in a certain way to B, and B is suggested only in so far as it is a term in this relation.

Now the crucial problem for parallelism is to show neural correlates for the boundless variety of special relations on which association depends. For example, I find in a Latin grammar the line "Tum pius Aeneas umeris abscindere vestem"; I immediately think of a notice which I had seen in St. John's College, Cambridge, "Smoking is not allowed in the courts and

grounds of the college." Now it is true that I had already recognised this notice as forming an English hexameter. But why should it be recalled by me at that precise moment? Because the two lines correspond as exactly in metrical construction as the hexameter of stress can correspond to that of quantity. But the relation between the two lines exists only in one highly abstract aspect, their likeness in metrical form. What counterpart can this have in a neural habit connecting the excitement of one group of neurons with the excitement of another group, each having for its psychical correlate certain groups of sensations and sensuous images?

Or take as another example the lines:

> Music that gentlier on the spirit lies
> Than tir'd eyelids upon tir'd eyes.[1]

What on the side of neural habit can correspond to the associative connexion here, which consists in a subtle analogy between the relation of a certain kind of music to a tired spirit and the closing of tired eyelids upon tired eyes?

Now it is true that our ignorance of what takes place in the brain is immense, so that after all it may not be impossible that some parallel in the neural connexions may exist corresponding to such associations of ideas. But this appeal to ignorance is the only resource open to the parallelist. Otherwise he is helpless. In any case, the mere law of neural habit is, by itself, utterly insufficient to account for the facts. We have next to examine this law of neural habit itself. The question is whether, apart from other assumptions, and in particular apart from the

[1] Tennyson, *Lotus Eaters.* The illustration is used by McDougall, *op. cit.*, p. 173.

independent cooperation of conscious process, it can be made to account for the facts.

The law is that the "passage of a nervous impulse through a chain of neurons leaves that chain more or less permanently altered, in such a way that its resistance to the passage of the impulse is in some degree diminished."

Now, if this is put forward as a complete account of the way in which neural habits are acquired, it is obvious that there is a vicious circle. For it presupposes that nervous impulses are already restricted to definite pathways. When once it is assumed that a neural process pursues a definite course from *a* to *b*, then, according to the law of neural habit, fresh nervous impulses, starting from *a* under similar conditions, will tend to pursue a similar course; and the more frequently they have traversed this line before, the stronger is the tendency to traverse it again. But the law does not account for the original restriction. To explain this we must have recourse to some other principle. The question is whether the physiology of the nervous system can, by itself, supply such a principle. The only suggestion which has been made from this point of view is that when two groups of neurons have been excited simultaneously or in close succession, the discharge of nervous impulse from the one to the other meets with less resistance. But, in the first place, it is by no means clear why this should be so, and, in the second place, it does not cover the actual facts of the formation of neural habits.

The clearest and most typical cases are supplied by the acquisition of bodily aptitudes for such actions as walking, speaking, swimming, dancing, and so forth. Now these are not learned merely by passive repetition of movements which we have chanced to make in the past. They involve throughout a selective activity by which unsuitable modes of behaviour are weeded out and suitable modes of be-

haviour are stamped in. The interest, aim or purpose of the subject is, at every step, a controlling factor which excludes what does not satisfy it and retains and repeats what does satisfy it. When a child is learning to walk, its achievement at first falls far short of its endeavour. Only a certain series of muscular contractions, in proper combination, order and proportion, is capable of realising the end aimed at, with the maximum of rapidity, certainty and facility. At the outset, muscles are contracted which are superfluous, and this operates as a disturbing condition. Others are not contracted in the right combination, at the right moment, or in the right measure, so that action is deranged. Obviously, if these relatively unsuccessful modes of behaviour were retained and repeated in the same way as the successful ones, the child would never learn to walk at all. He would go on stumbling and falling all his life, as he stumbled and fell to begin with; and the same holds good for such later acquisitions as swimming or golf playing. Now, plainly, no principle which confines itself to the assertion that conjunctions of nervous processes tend to recur again merely because they have occurred before will account for this selection of successful modes of behaviour and gradual elimination of unsuccessful modes of behaviour.

We must also recognise as an essential factor the controlling influence of subjective interest, the direction of conscious life towards ends. The question for parallelism is whether any likely physiological correlate can be found for this teleological control. The psychical factor is plainly revealed to us in every moment of our lives; it is a *vera causa*, one which is independently known to exist. If it has such a nervous counterpart as must be assumed by a consistent parallelist, this nervous counterpart is certainly not independently known. It is merely conjectured on the

basis of the general hypothesis of parallelism. Can this conjecture be put into a likely form? In the present state of physiological knowledge, no positive and distinct hypothesis is to be found which has any plausible claim to cover the facts. Here again, parallelism must appeal to our immense ignorance of what takes place in the brain. But this appeal to ignorance is not a positive argument. If we take the facts as they stand, it seems to be a natural hypothesis that the selective and controlling influence of subjective interest is a distinct factor which independently cooperates with physiological conditions in the formation of nervous habits.

This view is reinforced by another consideration. It is an intensely significant fact that interest and attention are present only in the process of forming neural habits, and tend to disappear in proportion as the nervous pathways become fully fixed and organised, approximating in character to those on which reflex action depends. "It is a familiar truth that the first acquisition of a habit or an association requires attentive effort and clear consciousness of the several steps of the process, and that with repetition the process goes on more 'automatically,' more smoothly and easily and with less clear consciousness of the end, or of the steps, or of the impressions by which it is guided; and finally, after sufficient repetition, it seems to go on without any effort or attention, and without our being conscious of it, save possibly in an extremely obscure fashion."[1] Interest and attention, then, are found only "where a new path has to be forced through the untrodden jungle of nerve cells."[2]

What can be the reason for this limitation? The most obvious interpretation is that interest and attention are pre-

[1] McDougall, *Body and Mind*, p. 276. [2] *Ibid.*, p. 277.

sent where they are needed for the special work of teleological direction, and that where the nervous processes have become so educated by the previous cooperation of conscious attention and interest, that they can pursue a definite and useful course by themselves, they are then left to themselves. A machine, such as a watch or a steam engine, when once it has been constructed and adjusted and set in action in accordance with conscious thought and purpose, may go on working by itself in fulfilment of conscious design; in the same way cerebral processes, when once they have been fully organised under the control of the "spirit's plastic stress," may proceed of themselves without the cooperation of consciousness.

Are we then justified in rejecting parallelism altogether as a baseless and arbitrary suggestion? This would be too hasty in view of the fact that for the last fifty years it has been the orthodox creed of physiologists and psychologists alike, and that even now it is more widely accepted than any other. What reasons have given it its currency among the highest authorities? These are partly scientific and partly metaphysical.

On the scientific side the main motive is the desire to maintain continuity in the physical explanation of physical phenomena which would be broken by the admission of a psychical factor as conditioning physical processes within the brain. This general presumption, which might otherwise be dismissed as merely a hardened prejudice, takes shape as a special argument in connection with the principle of the conservation of energy. According to this principle, energy can be neither created nor destroyed within the material world, but only redistributed. It is urged that if an immaterial agent cooperates in the production of material phenomena, it must in so doing increase or diminish the quantity of energy in the material system

on which it does work, and so violate the law of conservation.

Abstractly taken, it seems a sufficient reply to this argument to point out that the law of conservation refers only to redistribution of energy within purely material systems. What it affirms is that no material conditions can bring into existence or destroy energy. It does not determine what may happen when an immaterial factor is brought into play. But this suggestion seems to be undermined by the special results of experimental research on the energy-transformations of the human body. It has been shown by exact inquiry that "the energy value of the output of the human body in the form of work, heat, chemical products, and so forth, equals almost exactly the energy value of food and oxygen absorbed—that is, the value of the sum-total of energy supplied to the body."[1] Hence it seems to follow that if the mind acts on the body, it cannot do so by increasing or diminishing material energy.

Does it therefore follow that there can be no interaction between body and mind? This is by no means an inevitable consequence. For modes of interaction are conceivable which do not involve any exception to the principle of conservation. It may be that material energy is being continually transformed into psychical energy and retransformed into material energy. Again, it may be that the agency of mind is merely directive, so that it guides and determines redistribution of energy without increasing or diminishing its amount. The possibility of this has been maintained and defended by the greatest authorities on physics such as Lord Kelvin; and there seems to be no doubt that it is a tenable hypothesis.

None the less, it seems to me that the experimental

[1] McDougall, *ibid.*, p. 93.

verification of the law of conservation in the special case of living organisms does decidedly count in favour of the view that here as elsewhere material processes are to be explained through purely material conditions; and that this presumption ought only to be given up where it is plainly inconsistent with ascertained facts.

The metaphysical argument in favour of parallelism is based on the utter dissimilarity of mental and material facts. Interaction between *a* and *b* means that change takes place in one of them because change takes place in the other. But why should change in *a* make any difference to *b*? If *a* and *b* are otherwise unconnected, there is no sufficient reason. Both from the nature of the case, and in view of all that we know in detail about causal connexion, it would seem that *a* and *b* must be related to each other in special ways in order to account for the possibility of their interaction. All material things, for instance, are connected as having extension, position, and motion in space, and their causal relations are throughout conditioned and determined by their spatial relations. But psychical occurrences are so utterly disparate in nature that they cannot be conceived as united in any kind of whole or unity with physical occurrences such as the spatial system in which material things are included.

The nature of the difficulty becomes clear when we turn to details. It sounds absurd to say that the carriages of a railway train are linked together by a sentiment of amity. But is the absurdity any less when we turn to the special case of the brain? "Let us imagine the molecules of the grey matter combined in such a way that they will fall into simpler combinations on the impact of an incident force. . . . How is the idea of food to prevent this decomposition? Manifestly it can do so only by increasing the force which binds the molecules together. Good! Try to

imagine the idea of a beefsteak binding the molecules together. It is impossible."[1]

The difficulty seems to be very real; it constitutes a problem which can only be solved by bold metaphysical speculation concerning the ultimate nature of matter and mind and their relative place in the universe. For our present purpose, however, it is sufficient to point out that parallelism and interactionism are here on the same footing logically. Both are equally confronted with the same difficulty. Nay, it seems aggravated in the case of parallelism. For the uniform concomitance and variation of mental change and bodily change implies a connection between them even more intimate than that of interaction, and therefore even harder to reconcile with what has been called the "fathomless abyss that separates matter from mind." Further, there does not seem to be any satisfactory metaphysical theory serving to make parallelism intelligible which will not equally make interaction intelligible.

The result of this prolonged discussion may be summed up as follows. In view of our ignorance of what may take place in the brain, it would be rash to decide absolutely in favour of either view. The hypothesis of interaction seems to offer the most obvious interpretation of some important facts and that of parallelism fits others.

§ 6. **The Bearing of the two Hypotheses on Psychological Procedure.**—There is one final question which remains to be considered. What difference ought the rival theories of interaction and parallelism to make to us as psychologists? The answer is that it ought to make no essential difference which of the two views we accept.

[1] Mercier: *The Nervous System and the Mind*, p. 9.

The reason is that the theory of the relation of body and mind must be founded on the data supplied by psychological research and not inversely. Psychology in its own independent procedure must supply the facts and the indispensable assumptions to which any such theory is bound to conform.

Now there is only one vital requirement which must be fulfilled by any hypothesis concerning the connexion of body and mind in order to bring it into general harmony with the psychological point of view. It must recognise that conscious striving after ends, with the intelligence and interest which it involves, plays a real and indispensable part in the attainment of these ends. The full recognition of this is an indispensable presupposition, not only of psychological science, but of all history and biography, of all social intercourse, and of the common-sense knowledge through which alone we can live our daily lives and adjust our actions to the world of which we are a part.

If we look back upon the time which has elapsed since the first advent of man upon this planet, we find that during this period the face of the earth has been transformed by human endeavour. If, for instance, we survey such a city as London we are confronted on every side by objects which are the work of human beings, not merely the work of human hands but the work of human minds. Railroads, telegraph wires, telephones, streets and houses, shops with their contents, parks, gardens, and so on in endless catalogue—all these are embodiments of human thought and will In the time when man dwelt in caves or trees, these things were not. They have come into being by a long process of development—a process which can only be described as the gradual self-realisation of conscious endeavour or purpose.

Again, there is another and even more important aspect of human development. Conscious endeavour in realising itself has also transformed itself. Not only has it shaped more complex and varied means for its own satisfaction, but in doing so it has itself become more varied and complex. A printing press would have been of little use to a cave-dweller, not merely for lack of knowledge how to work it, but also because the interests which it is constructed to satisfy were not felt by him. As conscious striving has moved towards its own satisfaction, it has itself grown and expanded. In and through the process of supplying existing wants, other wants and sources of interest have come into being. The whole of this progress, be it noted, presupposes not only that conscious beings, as such, are really agents determining the course of events, but also that they proceed on the assumption that they are so. If they had proceeded on the opposite assumption that they were merely passive puppets—mere playthings of external forces—they would not have advanced a step towards the satisfaction of their needs.

Plainly any doctrine of the relation of body and mind which is incompatible with the function of conscious beings, as such, in determining their own development and in shaping the external world in accordance with their requirements, stands self-condemned from the outset. Now, it is clear that interactionism satisfies this test; for the interactionist explicitly and unambiguously asserts that the mind shapes and uses the brain as an instrument in the fulfilment of its own interests. But what about parallelism? Does not the parallelist reduce conscious agency to a pure illusion?

The answer is that all depends on the way we interpret the fundamental thesis of parallelism. The thesis, apart from any special interpretation, is merely that conscious

processes regularly accompany certain nervous processes, without interaction between them. If, now, we proceed to add the further statement that the conscious processes are merely an idle and superfluous accompaniment which might be omitted altogether without making any difference, then conscious agency is abolished and parallelism so interpreted is therefore an utterly indefensible position.

Doctrines of this type have been put forward by high authorities—under such names as materialism, automatism, or epiphenomenalism. Perhaps the word which best characterises the general position is epiphenomenalism. Consciousness is regarded as a superfluous apparition or phenomenon which unaccountably crops up at a certain stage in the course of material processes; it cannot be accounted for as following from material conditions in accordance with the laws of material causation; and when it does come into being it remains aloof in lonely isolation without in any way taking part in the general business of the universe. It has no more influence than the sound of the steam whistle has on the motion of a railway train.

But this view of consciousness as an idle and superfluous bye-product is by no means essential to parallelism. The parallelist may say, and, if he is strictly consistent, he ought to say:—I do not deny but rather affirm conscious agency: my position is merely that wherever there is conscious agency it is accompanied by a parallel series of occurrences in the brain, and that unless it were so accompanied it would not be effective in the attainment of its ends. Human action involves both factors in inseparable unity.

This, of course, raises the question: What distinctive functions are we to assign to the two partners thus inseparably united? To conscious endeavour, on the one

hand, and nervous process on the other? For neither of them can be a sleeping partner.

Here there seems to be only one course open to the parallelist. He must distinguish two aspects in the products and results of human activity. On the one hand, they may be regarded merely as modifications of the position and motion of bodies and of the redistribution of energy. Under this aspect, they will, according to the parallelist, be exhaustively accounted for by reference to purely material conditions, including especially what takes place in the neurons of the brain. But, on the other hand, they have also and as well the quite distinct character of being embodiments or expressions of human thought and will. Under this aspect, they cannot be accounted for by any material conditions, but only by the agency of conscious beings as such.

Let us take as an example a play of Shakespeare. On the theory of parallelism, "if we know thoroughly the nervous system of Shakespeare, and as thoroughly his environing conditions, we should be able to show why, at a certain period of his life, his hand came to write on certain sheets of paper those crabbed little black marks which we for shortness' sake call the manuscript of *Hamlet*. We should understand the rationale of every erasure and alteration therein without in the slightest degree acknowledging the thoughts in Shakespeare's mind."[1] As we have seen, the parallelist, in asking us to believe this, demands much more than the evidence warrants. But even if we concede what he postulates, there is still left over something which is not explained. What is left entirely unexplained is just the play of Hamlet, as such. The play, as such, is not merely the

[1] W. James, *Principles*, vol. i., p. 132.

material thing which we describe as constituted by certain black marks on certain sheets of paper. It is rather the *meaning* of these marks and of their arrangement. But this cannot be accounted for by material conditions. The only possible explanation is that the thought and will of Shakespeare expressed themselves in and through the written characters, so that the making of the black marks on paper was for him a means to an end.

Physical science, on the contrary, knows nothing of ends or of means to ends. Teleological activity is a concept peculiar to psychology. It is so because it presupposes the relation of the subject, as such, to its objects, as such. It is a transaction between a conscious subject and its object, as such. A certain actual situation is perceived or believed to exist, there is the thought of its being altered in a certain way, and the change is not only thought of but desired. This constitutes the direction of mental activity towards an end. The advocate of parallelism holds that the mental activity is always conjoined with a corresponding material process in the brain, and that its efficiency in producing changes in the external world is coincident with the operation of the concomitant material process.

But if he is to avoid absurdity, he must not affirm that the material conditions taken by themselves supply a complete explanation. The complete explanation is to be found only by taking together both the psychical and the physical factors. Either in detachment from the other yields only a one-sided account of the total fact. For the purposes of physiology the one-sided account referring only to the material conditions may be all that is required. For the purposes of psychology the one-sided account referring only to the psychical conditions may be all that is required. But on the hypothesis of parallelism,

rationally interpreted, both the psychologist, as such, and the physiologist, as such, miss an essential aspect of the whole truth. The position of neither is ultimately tenable in isolation from that of the other.

The enlightened parallelist will therefore account for the production of the manuscript of *Hamlet* as follows. The manuscript may be regarded from two points of view, each taking account of only one aspect of its nature. In the first place, it may be regarded merely as one portion of matter among others, possessing in a special form only the attributes common to the material world in general. From this point of view, its existence can be accounted for through merely material conditions, including especially certain occurrences in that portion of matter which we call Shakespeare's brain. But the manuscript is not merely a material thing; it is also the manuscript of a play to be read and acted and criticised. From this point of view, explanation in terms of material conditions entirely break down. What is essential here is the mind, not the brain of Shakespeare; what is essential is Shakespeare as a subject, thinking, feeling, willing, and adapting means to ends. It is this teleological point of view which is distinctive of psychology; and whether we adhere to the hypothesis of parallelism or to that of interaction, this teleological point of view remains unaffected.

BOOK I.

GENERAL ANALYSIS.

CHAPTER I.

Ultimate Modes of the Relation of the Conscious Subject to its Objects.

§ 1. **Introductory.**—We may begin by borrowing an illustration from a useful little book by Miss Brackenbury. Suppose a student to make a record of his or her experience during five minutes of a lecture. The student has probably recorded "that he more or less apprehended the meaning of the lecturer's words, accepting his statements and reasonings or, perhaps, occasionally dissenting from them or questioning them. . . . Further, he may have recorded that he was attending to the lecturer, that he was trying to follow his argument. He was working. . . . Again the student may have recorded, that he was enjoying the lecture, was taking pleasure in the development of the argument so that he found concentration on it easy; or he may have recorded that he was being bored or annoyed by the subject, that his state was not one of pleasure but of dissatisfaction, and that he felt repelled by the subject and unable to concentrate on it." [1]

[1] Miss Brackenbury, *Primer of Psychology*, pp. 10-11.

This analysis illustrates the three fundamental ways in which the conscious subject as such is related to its object, the cognitive, the active, and the affective. He assents dissents, or doubts—the cognitive attitude. He attends —the active attitude; he is pleased, bored or annoyed—the affective attitude.

§ 2. **Simple Apprehension.**—Behind all more special relations of the conscious subject to its objects there is a more general relation which they all presuppose, the general relation itself of subject and object, considered abstractly in distinction from the special forms which it may assume. It is a pre-condition of the cognitive attitude, the feeling attitude, and the conative attitude that there should be something before the mind with which they are concerned. Simple apprehension is the term which seems most suitable for naming this bare presence of an object to consciousness without indicating any more special relation in which the mind may stand to this object.

It may be suggested that simple apprehension really comes under the head of cognition. But a closer examination of the facts shows that the cognitive or theoretical attitude always involves a more special relation of the mind to its object. It involves either judgment or doubt or mere supposition. Let the object before the mind be what is meant by the words "that the moon is made of green cheese" or "the moon's being made of green cheese." Simple apprehension requires only that the meaning of the words should be understood. But besides this there is always either belief, disbelief, doubt or supposal. The moon's being made of green cheese is either accepted as fact or rejected as fiction, or a question is raised as to a whether it is a fact or not; or again, it may be only provisionally assumed for a certain purpose, as when we say "if the moon were made of green cheese, there must have

been a cow to supply the milk," or when we allow ourselves to fancy this to be so in reading or inventing a fairy tale.

The object of simple apprehension is whatever the mind means or intends to refer to. The book I see before me on the table is an object to me, inasmuch as I perceive it. The immortality of the soul is also an object to me whenever I think of it. *Nothing* is an object to me, whenever I use the word *nothing* and attach a meaning to it; so is a Centaur when I imagine one. To perceive or think at all is to perceive or think of something, and this something, just because it is perceived or thought of, is an object presented to consciousness.

When we ask a man what he is thinking of, he may reply "the moon," or "the college," or "the soul," or "my toothache." But such answers are essentially incomplete. Their incompleteness is shown by the fact that they always leave room for such further questions as, *What* are you thinking about the moon? *What* are you thinking about the soul? These questions require some such reply as: I am thinking of the moon attracting the earth, or of its causing the tides, or of its being made of green cheese, or of its existence; I am thinking of the question whether there is a soul, or the question whether the soul is immortal. What really is before the mind of the man as the object of his thought is not merely the moon or the soul, but what is meant by such expressions as "that the moon causes the tides," or "that it attracts the earth," or "that the soul either exists or does not exist," or "that it either is or is not immortal." In general, it would seem that a complete object can only be adequately described in language, not by isolated words but by propositions capable of being asserted, denied, doubted or assumed. The full object requires to be

expressed in the form that "something is or is not so-and-so."

This will help us to understand another point which ought not to be omitted by the psychologist, though full discussion of it must be reserved for Logic and Metaphysics. The object of thought retains for consciousness an identity which is independent of time and change—identity of meaning. Events begin and cease; but what the mind apprehends is not the mere event as it occurs, but the "fact" that it occurs or the fact of its occurrence. Now though the event itself begins and ceases in time, the fact of its occurrence does not thus begin and cease. The battle of Waterloo began and ended on a certain day in June 1815. But the fact of the battle's occurrence at that date is not limited by time conditions. That the battle took place at that date is a fact at the present moment.

It follows from this that our transient experiences or feelings as they come and go can never be complete objects of thought. Our object is rather "that they exist" or are felt or are of such a nature. My present toothache as a mere feeling or immediate experience is not the object which I apprehend; what I apprehend is rather the fact that it is felt by me; and the fact of its having been felt by me does not disappear for me when the feeling itself is over. The fact of its having been felt is permanently recognisable as identical with itself whenever I think of it; the fact of its being felt at a given moment can never be changed into the fact of its not being felt at that moment.

We must distinguish the act of apprehension from the object apprehended. The act of apprehension is an event which happens in our own mental history; the object is a meaning which is the same whenever it is apprehended.

We may think the same thought again and again: by this is meant that we again apprehend the same object, that we again mean to refer to the same thing But the acts of thinking or apprehending are distinct events in the time-order of our conscious life. I can apprehend the colour red again and again on different occasions, and identify it as the same. But on each separate occasion I have a separate perception. The perceptions are so many distinct events or occurrences in the history of my individual experience. The sensible quality is not an event in the history of my experience at all. It is an object which may be perceived and identified as the same in many different phases of my life-history widely separated in time. The same distinction becomes still more obvious if we take other instances. If I perceive a triangle, my perception is not triangular,—it is not made up of lines and angles. On the other hand, the triangle as it appears to me when I see it is not an occurrence in the history of my individual consciousness; it is a geometrical figure, which is a very different thing. Again, in a moment of time I may think of eternity: it is obvious that the specific modification of consciousness which exists while I am thinking of eternity, and disappears after I have ceased to think of it, is not itself eternity or eternal. Similarly, I may think of non-existence; this is an actually existing thought; and the specific modes of consciousness which give it its specific nature must actually exist. They cannot therefore be identified with the object of the thought, which is non-existence. The object itself can never be identified with the present modifications of the individual consciousness by which it is cognised.

It is particularly important to note that this identity of the object remains unaffected by its being more or less fully apprehended. This is regarded as only a difference

in relation to us which leaves the object unchanged in other respects. It is the same object which is first less fully and then more fully before the mind. Try to bring before your mind the events of yesterday or the fifth proposition of Euclid or what you know of the relation of body and mind. At first your thought is relatively vague and incomplete; but, as you proceed, details gradually emerge which were not apprehended before; in a sense these details are relatively new objects; but they are apprehended as partial aspects or features of the one total object with which you are throughout occupied, the events of yesterday, or the fifth proposition of Euclid, or the relation of body and mind.

Similarly, in observing something presented to the senses, such as a flower, different parts and characteristics are presented successively to sight and touch. But throughout the mind recognises its total object as the same; the identical object is the nature of the flower, which is disclosed now under this aspect, now under that. In general, when we are observing or thinking about an object, the object without ceasing to be recognisably the same appears under different aspects. Now this, now that characteristic feature or relation is brought before consciousness. Indeed the processes of observing and thinking essentially consist in an endeavour to cognise relatively new phases of their object. So far as the object is already known there is nothing for them to do.

Professor Titchener gives an example which may serve to illustrate what is meant. He says to his reader:—"Close the book and look steadily at the table in front of you and try to think continuously of that. You will find that steadiness is impossible. There is a tendency to let the eyes wander, to let them follow the grain and pattern of the wood or to travel over the various objects lying on the

table. If you withstand the temptation, your mind becomes a blank very soon indeed; the table gets to be quite meaningless to you. Presently the blank ends; you remember that you 'ought' to have thought of the table, and resolve to do so: the eyes try to wander again, and so the whole history is repeated."[1] The lesson of this illustration is that there is no such thing as complete mental immobility. As Titchener says:—"Mind goes on from moment to moment; it is never still." In attending to an object, though we are aware of the object as the same throughout, we apprehend it or endeavour to apprehend it in different aspects.

The central question for psychology in connection with objects is how they come to be apprehended by the individual subject at this or that moment in his life-history. What determines a particular thinker to think a particular thought when he does think it? In dealing with such problems it is necessary to keep in view the fundamental distinction which we have already made between two kinds of objects—those which are presentations and those which are not. Presentations actually exist at any moment as immediate experiences of that moment. When a bell is rung and I hear the sound, my sound-sensation exists at the moment as my own private experience. It did not exist before it was experienced by me, and it will not exist after it is experienced by me. On the other hand, the fact of a similar sound having been experienced before and the possibility of experiencing a similar sound again are not immediately experienced at the moment. The same is true of the bell itself and of the power of the bell to produce the sensation.

Now we may lay down, at least provisionally, the general

[1] *Primer of Psychology*, p. 8.

principle that presentations directly or indirectly condition the apprehension of all other objects, either directly by their actual existence as immediate experiences at the moment, or indirectly through dispositions formed in the course of previous experience. In one way or the other, the reference of thought to what is not immediately experienced is conditioned in a thoroughgoing way by what is or has been immediately experienced, so that all other variations and differences in the objects which the mind apprehends from moment to moment are correlated with corresponding variations and differences in presentational experience. It seems to be the function of presentations to specify and determine the direction of thought to objects which are not presentations.

§ 3. **Judgment and Supposal.**—"If ice were heavier than water, what we now call the temperate zones would be uninhabitable." I believe this proposition; in making it I judge. But in making it I have also before my mind two propositions which I do not believe, but disbelieve. I think of what is meant by the words "ice is heavier than water," and "the temperate zones are uninhabitable." Yet I do not judge either that ice is heavier than water or that the temperate zones are uninhabitable. What I do is to consider first certain general properties of ice and water, sufficient to enable me to recognise what I intend to mean by those words, *e.g.* the fluidity of water and the solidity of ice, and the temperature at which water freezes. I am then aware that these general characters, taken by themselves, leave an open field for certain special alternative possibilities and in particular for the special alternatives of ice being heavier than water or of its being lighter than water. But I do not commit myself to either of these alternatives as being the one which is realised; I do not even raise the question which of them is actual fact.

What I do is to *suppose* one of the alternatives realised, that of ice being heavier than water. Having made this supposition, I find myself committed to another, that of the temperate zones being uninhabitable.

It is characteristic of supposal that the mind has a range of arbitrary choice between alternative suppositions. It remains aware, in supposing one alternative to be realised, that it might equally well suppose others to be realised. On the contrary, it is characteristic of belief that the alternative believed in is determined for the mind and not by it. It is imposed on the mind by the nature of the object with which it is dealing. From this point of view, doubting and questioning must be regarded as belonging to the attitude of belief rather than to that of supposal. It is true that so far as we doubt, we are free to make alternative suppositions. But this is not what is distinctive of doubt. What is distinctive of doubt is that this very freedom is felt as an obstacle which we have to get rid of. So long as it lasts it holds the mind in suspense. What we are aiming at is a definite judgment that one of the alternatives is realised; and this means that we are seeking to bring before our mind conditions which *impose* this alternative to the exclusion of others. I doubt, for instance, whether a certain drawer in my desk contains papers or not. I am equally free to suppose either alternative realised. But this is unsatisfactory, because what I want is not a supposition but a judgment. I accordingly open the drawer, and the ensuing experience imposes one alternative to the exclusion of the other. The drawer is empty I can still make the supposition, "if this drawer, which is in fact empty, were full." But in doing so, I have provisionally to disregard the new datum supplied by opening the drawer.

Suppositions, as we have seen, occur as subordinate

parts of judgments. But this relation is reversed in the free play of fancy or imagination. Here, the primary and pervading attitude of the mind is supposal. In composing a fictitious narrative, the advance is from supposition to supposition, each step enlarging and supplementing what precedes, and the whole thus constructed is itself only supposed, not believed. Similarly, the reader or hearer of the fiction, who takes it for fiction only, accepts its successive statements only as something supposed. For instance, I find, in the beginning of a novel, the following sentence: "It was in the dusk of a July evening of the year 1813 . . . that I first met Captain Coffin as he came, drunk and cursing, up the Market Strand, with a rabble of children at his heels."[1] In reading these words, my mental attitude is not one of believing or of disbelieving, or of doubting as regards the existence of a person making this statement, or as regards the incident he describes. I am, from the outset, prepared for fiction; and this means that I am prepared to accept propositions put before me by the author in the way of supposal or make-believe or what children call "pretending." I am not disbelieving or doubting, simply because my belief is not challenged. The author invites me to make a series of suppositions under his guidance, and this I allow myself to do. If anyone should require me to proceed as if the fiction were fact, I should at once begin to disbelieve or doubt.

The attitude of supposal is, however, in no case quite unmixed with judgment. For instance, Sir A. Quiller Couch, in writing the novel quoted above, is dealing with human life—and with human life in England and particularly in Devonshire in the year 1813. He has therefore to construct his imaginary incidents and scenes and

[1] Sir A. Quiller Couch, *Poison Island*, p. 1.

characters in conformity with certain conditions which are accepted as real and are not merely supposed. Further, he is bound to be consistent. What he says on one page must agree with what he says on another. Having made a certain supposition he has to accept its consequences. In both these ways judgment intermingles with supposal and restricts the range of its free choice between alternatives.

In the order of mental development supposal comes later than belief. In the child, the first evidence of its existence is supplied by playful pretending, as when a boy gets astride of a stick and pretends he is galloping on horse-back. It may also enter into the play of animals, as when two dogs playfully enact a mimic fight or hunt, yet refrain from seriously hurting each other.

§ 4. **Feeling Attitude.**—The cognitive relation of the subject to its objects is clearly distinguishable from the interest it takes in them. The Latin *interest*, the third person singular of *interesse*, means primarily "there is a difference," and so comes to mean "it makes a difference." The word "interest" is here to be understood in the wide sense suggested by its derivation. The subject is interested in objects if and so far as they are not indifferent to him. Now an object could be entirely indifferent only (1) if the subject felt in no degree either pleased or displeased with it, neither liked nor disliked it, and (2) if he neither wanted it in any way altered nor wanted to maintain it unaltered. There are thus two ways of being interested: (1) the *affective*, and (2) the *conative*. Affection and conation usually go together and are blended in intimate unity. None the less it is important to distinguish them, for affection covers the passive side of our nature as conscious subjects and conation the active side. Let us begin by considering the affective attitude or, as it is sometimes called, the feeling-attitude.

The affective attitude consists in being pleased or displeased with something, in liking or disliking it. We must distinguish carefully between the subjective state of being pleased or the reverse and the objects which we find agreeable or disagreeable. When we say that music, or hockey, or football, or the eating of chocolates are pleasures, we mean that they are, more or less permanently and uniformly, sources of agreeable feeling. But it is the agreeable feeling itself as actually felt in relation to these objects which constitutes the affective attitude. The importance of this distinction becomes obvious when we take account of a fact which is of fundamental importance for the general nature of affective states, the fact that few definite objects or none can invariably be counted on as agreeable or disagreeable at all times and under all conditions. Pleasing things do not always please and displeasing things do not always displease. They agree or disagree with us according to their relation to the varying phases of our mental life as a whole. The taste of honey or the bright blue of the sky are approximately similar in character on their recurrence. But the connected feelings have not a corresponding constancy. The honey is pleasant if we have an appetite for it: otherwise it may disgust. The blue sky may be a source of joy if we are attuned to enjoy it; if, on the other hand, we are in a depressed and irritable mood, it may only increase our depression and irritation. The jest which would please us in an hour of relaxation may annoy us if we are in deadly earnest about some serious business.

The same point is illustrated by the varying affective values of the same objects according as they are variously combined, related or contrasted. The same colours or lines may displease according to the varying ways in which they may be arranged. Further, the affective value of an object

is, to a very great extent, dependent on the frequency of its recurrence. We get tired of the finest melody when it is hackneyed by constant repetition. Partridges may be palatable, but it is proverbial that in this case one may have too much of a good thing. On the other hand, even very disagreeable medicines become less so as we become used to taking them. This relativity of affective values to the complex totality of our psychical life at the moment supplies a characteristic distinction between affective states and sensations which recur with comparative uniformity whenever a sense-organ is similarly excited. Another characteristic difference is that distinct affective states are not capable of existing together in a simultaneous plurality as sensations are. Colour-sensations are constantly occurring together without blending in a single colour-sensation in which the parts are not separately distinguishable. The same holds good for touch-sensations and sound-sensations, and it holds still more obviously for combinations of experiences belonging to different senses—for combinations of sound-sensations with colour-sensations, or of colour-sensations with touch-sensations. The sensuous presentations do indeed unite with each other in complex wholes; but they do not lose their separate identity. It still remains possible, under sufficiently favourable conditions, to discriminate them from each other as distinct though related sensations. But affective states do not thus co-exist independently side by side, so that we can say: I have the feeling of being pleased and also along with it the simultaneous and distinct feeling of being displeased.

It is true that we may, and very commonly do, experience affective states which are neither purely pleasant nor purely unpleasant. Pleasantness and unpleasantness are then blended in a peculiar and indescribable way; but they are blended in a single indivisible feeling; they cannot

be discriminated as two distinct feelings separately experienced side by side. The true description is to say that there is a single affective state which partakes at once and in varying degrees of the character of pleasure and of the character of pain.

That such experiences constantly occur seems undeniable. Melancholy must always be tinged with sorrow or it would not be melancholy at all; yet there is such a thing as pleasing melancholy. In dwelling in memory on the words and actions of a beloved friend whom we have lost by death our experience often has a pleasing aspect, indivisibly blending with the pain of bereavement. But we do not have two distinct feelings, one of pain and one of pleasure. The case is not comparable with that of experiencing two distinct colour-sensations, as when we see a strip of blue side by side with a strip of red. A far better analogy is to be found in the relation of the sensation of purple to the sensations of pure red on the one hand and of pure blue on the other. The purple is a single simple sensation; it is not a sensation of red plus a sensation of blue. Yet, on comparison, we find that its quality is more or less akin to blue and also more or less akin to red. It is a reddish blue or a bluish red. Thus the various purples can, from this point of view, be arranged in a graduated series passing at one end into pure red and at the other into pure blue. The same is true of red-yellows, and of blue-greens, and of greys as intermediate between black and white. Similarly, affective states form a graduated series between pure pleasure and pure pain. The pure states are relatively rare, pure pleasure being decidedly rarer than pure pain.

The wrong doctrine on this subject is well illustrated by the speech which Shakespeare in *Hamlet* puts into the mouth of King Claudius, who is made to describe his state

of mind at his wedding with his brother's widow as follows:—

> "With a defeated joy,—
> With one auspicious and one dropping eye,
> With mirth in funeral, and with dirge in marriage,
> In equal scale weighing delight and dole."

Claudius was not only lying, but his lie was a psychological absurdity. One eye could not be weeping tears of sorrow, while the other eye was beaming with joy. Similarly, delight and dole could not exist simultaneously and separately like two weights in opposite scales.

Can our total consciousness at any moment be entirely devoid of pleasure and displeasure? This is a question which we may be at first sight tempted to answer decidedly in the affirmative. I may, it would seem, perceive a stone, or a clod of earth, or a geometrical diagram, without feeling either agreeably or disagreeably affected towards these objects. But the apparent plausibility of this answer disappears when we look more closely into the case. Why do we notice these objects at all? Perhaps we do so merely with the view of settling by experiment the question we are now discussing. But if that be so, the issue of the experiment itself is more or less satisfactory or unsatisfactory. We are in some degree pleased that our own pre-conceived view is confirmed, or displeased because it is apparently upset. If we have no pre-conceived view, we are pleased or displeased because we do or do not succeed in obtaining an answer to the question proposed. Thus, the affirmative answer turns out under these special conditions to be due to an oversight. We have not taken into account our total consciousness in relation to the object, but only a small and unimportant part of it. Now, suppose that, instead of having a pre-existing motive for noticing the object, we simply take cognisance of it because

it happens to pass before our eyes. Here it may be said that we are purely neutral in regard to it. But there are many things presented to our bodily vision of which we take no cognisance. The more pre-occupied we are, the more entirely they escape notice. If this or that object so obtrudes itself when our minds are pre-engaged on some other topic as to divert the current of our thoughts, it must have some interest of a pleasant or unpleasant character. If it does not divert the current of our thoughts, the cognisance we take of it will be slight and transient, and will form only a small and insignificant portion of our total consciousness. Thus our total consciousness may involve pleasant or painful interest, although this small portion of it does not contribute in any appreciable degree to its pleasantness or unpleasantness. Again, our minds may be comparatively disengaged, so that they are free to attend to surrounding things; but it is the characteristic of these idle moods that we are more or less amused or bored by the trivial objects which obtrude themselves on our senses. On the whole, the presumption appears to be that our total consciousness is never entirely neutral. The student must here be warned against a common fallacy: we are apt to suppose that we are only pleased or displeased, when we expressly notice, at the time, that we are, or remember afterwards that we have been, pleased or displeased. But in fact we only notice or remember when the pleasantness or unpleasantness is specially conspicuous. There is a customary level of agreeable or disagreeable feeling which we are apt to treat as a neutral state. In like manner, we do not notice that we are hot or cold, unless we feel more hot or cold than usual. Similarly, what we call silence is not absolute silence, but only a comparative absence of sound. This is shown when we pass from what we call silence to a still more complete absence of sound.

The previous state then ceases to appear to us as one of silence. As a matter of fact, sound of some sort is rarely if ever wholly absent from our experience. The same is in all probability the case with pleasure or displeasure. One or the other, or both, are always in some degree present, although we by no means always notice their presence.

When we wish to say that pleasure or displeasure belongs to this or that mental process, we may say that the process is pleasantly or unpleasantly toned. *Hedonic-tone* is a generic term for pleasure and the reverse, considered as belonging to this or that mental process.

Are there other kinds of feeling-attitude besides pleasure and displeasure? It would seem that there are. It is difficult to bring emotions, such as anger and fear, and sentiments, such as love and hate, completely under any other head. Certainly, an emotion, like anger, involves some kind of cognition; but it cannot be said that the specific experience of being angry directly qualifies the nature of the presented object; in other words, this experience is not a presentation. So, too, anger has hedonic-tone, mostly of an unpleasant kind. But its specific quality cannot be resolved into pleasure or displeasure. Again, it involves certain characteristic active tendencies; but there seems to be in it a peculiar and unanalysable mode of being conscious, which cannot be resolved into these. We must, therefore, conclude that in the complex emotion of anger there is included a specific feeling-attitude distinct from being pleased or the reverse. The same may be said of the other emotions.

§ 5. **The Conative Attitude.**—Conation, considered merely as a mode of consciousness in relation to objects, consists in wanting the object to be in some respect other than what it is or in wanting it to continue as it is. Clearly,

the conative attitude, as thus defined, is distinct from the cognitive. But it may not be so clear that it is distinguishable from affective states. Is not being pleased with a certain situation identical with wanting it continued, and is not being displeased with it identical with wanting it changed? This question may be decided by considering two classes of cases: (1) those in which the affective state presupposes as its condition a conation distinct from it; (2) those in which the affective state is prominent, when conation is comparatively feeble and obscure, if it exists at all.

As a typical instance coming under the first head, we may take the unhappiness of a zealous student if he is debarred from his favourite studies, excluded from books and papers, or disturbed by noises and intrusions. It is here untrue that the student first feels unhappy in his actual situation and that his desire to pursue his studies either simply is this unhappiness or follows from it. If he did not begin by wanting to pursue his studies the privation of books and papers would not make him miserable. He does not, in the first instance, want to study because he feels unhappy; we must rather say that primarily he feels unhappy because he wants to study and cannot do so. All pleasures and pains which are conditioned by success and failure belong to this type. They presuppose conation and cannot therefore be identical with it or even be regarded as generating it.

Of course, there are also many instances in which pleasure or pain is primary, and not dependent on a prior want. When this is so, the conative attitude arises in dependence on the affective. We begin by feeling pleased or displeased with a certain object, and in consequence we want it continued as it is or we want it to be changed. But where this is so, there is still a clear distinction between the

affective attitude and the conative attitude which results from it. The affective attitude is concerned with the object as it presents itself to consciousness at the present moment; the conative attitude is directed in a peculiar way, which cannot be further analysed or described, towards the future, toward what is not yet, but is to be.

The active side of our conscious being is essentially connected with the conative attitude. The nature of this connexion requires careful explanation. Evidently the mere wanting or desiring or consciously requiring something is not of itself sufficient to constitute agency. We must also add that such modes of consciousness have causal efficiency, that they operate as factors determining the course of events.

But causal connexion, by itself, is not sufficient. A man, in attempting to shoot a bird, unintentionally shoots another man, of whose presence he was quite ignorant. This result is not ascribed to his conscious agency, although it is, in a sense, a consequence of his wanting to shoot the bird. It is not ascribed to his conscious agency because it is only an accidental outcome of his action. It is neither what he primarily desired nor any part of the means or conditions recognised by him as required for the attainment of his end.

In general, conative consciousness constitutes the active side of our being, not merely because it is a factor operative in determining the course of events, but also because by its very nature it tends to bring about its own fulfilment. Further, this kind of causality is so connected with the intrinsic nature of conative consciousness that it can belong to nothing else. Apart from reference to such states as wanting, desiring, requiring, etc., we can have no conception of what it means. We may, indeed, think of a bent spring as if it were trying to unbend; but in doing

so, we are vaguely investing the spring with some sort of conscious life analogous to our own.

The words "failure" and "success" have meaning only in relation to conscious agency, as thus defined; and such agency is just as much implied in the conception of failure as in that of success. When we are aiming at a mark, we are equally active whether we hit it or miss it. Indeed, the characteristic nature of subjective activity is most fully expressed by a series of trials in which relative or complete success is gradually reached through partial failures, as in the case of the spider whose perseverance encouraged Robert Bruce, or in the case of the Bruce's own reiterated attempts to gain the Scottish crown. Where failure leads to persistency with varied effort, in which relatively satisfactory modes of procedure are, *pro tanto*, continued or renewed, while relatively unsatisfactory modes of procedure are discontinued or altered, conative consciousness operates throughout as a tendency towards its own fulfilment. It is only a *tendency*, because the ultimate result does not depend on it alone, but also on the cooperation of other factors, and where these fail ultimate success is unattainable.

We must distinguish between the conditions which are, as a matter of fact, necessary and sufficient to satisfy a conative tendency, and what the subject himself initially apprehends as required to satisfy it; between what he really wants, and what appears to him to be wanted; between the end-state which would actually bring fulfilment of his need, and the end as an object of his consciousness. It is a general condition of conation that the subject should initially have some cognisance of what it is that he is seeking; but this initial apprehension may be exceedingly vague and incomplete. In all cases, the subject is confronted with a situation which he is aware of as alterable

and wants altered. But he may not have any definite apprehension of the special kind of alteration required. All that is necessary to constitute an object of conative consciousness is such cognisance of the conditions of satisfaction as may serve as a clue, however vague and fragmentary, to the subsequent development of the psychical process. The clue may be very vague indeed; it may be so vague that we should not in ordinary language describe it as a cognition of the conditions of satisfaction. All that is required is the presence of some idea or perception which prevents the course of the conative process from being entirely indeterminate. It should also be noted that even when the initial presentation is relatively precise it may be misleading. I may desire to eat an apple which I assume to be in my pocket; but on trial I may find that no apple is there. Or, I may find the apple, and then be disappointed when I come to eat it. I discover that what I really want —the actual satisfaction—is not what I supposed it to be. Strictly speaking, we only come to know what we want with complete determinateness in the actual process of attainment. In "learning by experience" the initial presentation of the conditions of satisfaction is continually being corrected, defined, and enlarged by trial and error. We are continually finding out what we do or do not really want. Suppose that I sit down to solve a chess problem. I start with a certain end in view (the object of conation). I endeavour to discover a certain series of moves, limited in number, bringing about inevitable mate. So far the end is defined as an object of consciousness at the outset. But it is not wholly defined. Its full determination comes only with its attainment. If I possess at the outset the knowledge of just that series of moves which is required, satisfaction is already attained: there is no problem, for the problem is already solved. Just in so far as the cona-

tive process has anything to achieve, its end is not already determined, but relatively indeterminate. Initially the end is only so far presented as to give a prompting clue, which starts the mental process in a certain general direction. This example is typical, and we need not add more here; for the whole course of mental development, as we shall have to expound it in other parts of this work, yields incessant illustration.

It will be evident from what has been said that there is some ambiguity in the use of the word *end* in reference to conative process. It may mean either (1) actual satisfaction of conation, or (2) the conditions of satisfaction as they appear to conative consciousness before the satisfaction is actually and completely attained. In sense (1) the term *end*, whatever else it may imply, implies also its ordinary literal meaning of termination or cessation. When conation is completely satisfied it completely disappears. Appetite for food ceases after a full meal; intellectual curiosity ceases when the problem is solved, and so on. The end in which striving consciousness finds satisfaction is, when completely achieved, the termination of the striving. This fact is apt to be obscured by two circumstances. The first is that in the process of satisfying one conation others frequently come into being. Thus, in finding the answer to one question we may find other questions emerge of equal or greater interest. But it remains true that our initial curiosity concerning the first question ceases when that question is fully answered. In the second place, there are some ends so complex that they can only be realised by a long series of successive steps, and some, such as the moral idea, which can never be realised completely. But even in these cases, *so far as* satisfaction is attained, conation ceases. We press on, forgetting the things that are behind. The end, in this sense, implying actual satis-

faction, and with satisfaction the cessation of the conative process, may be called by way of distinction the *end-state* or *terminus*. We may then confine the word end to its second meaning as *object* of conative consciousness—the conditions of satisfaction as apprehended by the subject before actual attainment. In this connexion it is important to remember that the subject may be mistaken as to what he really wants, that his initial clue may be very vague and fragmentary, whereas the actual conditions which would satisfy him are definitely fixed by his own constitution and that of the world in which he lives. It should also be noted that while we are actually pursuing an end, we do not usually represent it as the cessation of the mental process which is directed towards it. We attend rather to the positive nature of the conditions which are to satisfy us. Now these conditions when they are attained usually take some time to produce their full effect. Appetite for food is satisfied by eating: it does not however disappear as soon as we begin to eat; it only ceases when we have eaten to satiety. But the hungry man looking forward to a meal thinks of the whole process of eating, not of the moment in which his appetite will be completely appeased and therefore cease to exist. On the other hand, it is precisely this moment of satiety which constitutes the end in the sense of end-state, or terminus.

CHAPTER II.

ATTENTION.

§ 1. **Its general nature.**—We can broadly distinguish two directions of mental activity, the theoretical and the practical. When I am interested in an object, the satisfaction of my interest may depend partly or wholly on keeping it before my mind or in obtaining more definite and adequate knowledge of it. My attitude may be essentially an interrogative or questioning attitude. I am then active in making the object disclose its nature more fully and unambiguously, without altering it in other respects, except as a means to this end. The end towards which conative consciousness is directed is attained merely by the fuller apprehension of the object, the formation of judgments and suppositions concerning it, the answering of questions and the removal of doubts, the growing distinctness and fulness of the play of imagination, or, in some cases, the mere maintenance of the object before consciousness until interest in it is exhausted.

So far as the work of the mind on its objects is of this kind, it is what we call Attention. Attention is simply conation so far as it requires for its satisfaction fuller cognisance of its object without other change in it.

Theoretical and practical activity, though they are abstractly distinguishable, yet constantly blend with and condition each other. The attainment of practical ends constantly requires fuller knowledge of what is aimed at

and of the means of obtaining it. To this extent practical interest involves a theoretical interest which takes the form of Attention. On the other hand, it often happens that fuller knowledge of the object requires us to make practical experiments with it. Thus, we may have a practical end in view, and we may, for the sake of this end, attend to the conditions and means of its attainment. I may wish to climb a rock, and I first observe it carefully to determine the best mode of ascent. So far, all I have gained is more complete knowledge. This is a partial satisfaction of my original desire. It carries me a stage nearer to my end; but it does so only because it makes further steps possible. On the other hand, my interest may be purely theoretical. I may simply desire to know the geological structure of the rock. In this case mere observation will be sufficient. If it is necessary to climb the rock, the climbing will be merely a means of making observation possible, just as in the previous case observation is merely a means of making climbing possible.

§ 2. **Attention as the essential form of all mental activity.**—Ultimately, we cannot attain any practical end by our own agency otherwise than by attending. The only way in which we can produce changes in our environment is through bodily movements. But the only way in which we can actively determine our own bodily movements is by attending either to the idea of making the movement or to the result which is to be brought about by it. Given that we are able to perform the required movement, all that is necessary for its performance is a certain exclusive predominance of the thought of it or of the end to be attained by it.

The general principle is that when the "doing of something," the thought of something to be done, occupies consciousness to the exclusion or repression of conflicting

suggestions, then the action follows. "Try to feel as if you were crooking your finger, whilst keeping it straight. In a minute it will fairly tingle with the imaginary change of position; yet it will not move sensibly, because *its not really moving* is also a part of what you have in mind. Drop this idea, think of the movement purely and simply, with all the breaks off: and presto! it takes place with no effort at all." [1]

Such exclusive dominance of the thought of an act or of its result may be due to our wanting or desiring the act or its result. To this extent the performance of the act is our deed; it is a development of our conscious agency. For instance, we may cease to think of keeping our finger straight and only attend to the proposed crooking just because we want to crook it and don't want to keep it straight. Or we may simply forget about keeping it straight and then the same act follows involuntarily.

When the dominance of the idea of something to be done is not due to our wanting, wishing, or requiring it to be done, but to other conditions, the ensuing action is called *ideo-motor*. Ideo-motor action is well illustrated by cases of so-called "thought-reading," in which a person who has hidden some small article concentrates his attention as completely as possible on the article and its hiding-place. When he does this he involuntarily and unawares makes slight movements which are capable of revealing to others the direction in which the concealed object is to be sought. Similarly, in certain stages of the hypnotic trance, the subject performs every act which is suggested to him, simply because the idea of the act occupies his consciousness to the exclusion of conflicting alternatives.

[1] James, *Principles*, vol. ii., p. 527.

Ideo-motor action is also a common occurrence in daily life. "Whilst talking I become conscious of a pin on the floor, or of some dust on my sleeve. Without interrupting the conversation, I brush away the dust or pick up the pin. . . . The mere perception of the object and the fleeting notion of the act seem of themselves to bring the latter about."[1] Sometimes the transition from idea to action is contrary to desire. "A youth about to make his first speech foresees that he will tremble and turn pale and perhaps become incoherent." What he wishes is to behave in quite a different manner: and yet at the critical moment, the idea of how he fears to behave so occupies his mind "that he inevitably behaves in the way he expected."[2]

§ 3. **Distinction between Attention and Inattention.**—Let us call the totality of objects which are present to the mind at any one moment the "field of consciousness." Only part of this field is attended to; with the remainder we are not actively occupied. Thus the total field of consciousness is broadly divisible into two parts, the field of attention and the field of inattention. This is frequently illustrated by comparison with the field of view presented to the eye. At any moment only those features of the field of view are clearly and distinctly seen on which we fix our eyes, so that impressions coming from them reach a certain circumscribed portion of the retina called the yellow spot. The other parts of the visual field seen, as we say, "from the corner of the eye" are, in a peculiar way, blurred and dim.

Similarly, the field of consciousness normally embraces a central area of clearly apprehended objects and a marginal zone of objects which are apprehended indistinctly.

[1] James, *ibid.*, p. 522. [2] A. Shand, *Mind*, N.S. 1893, p. 453.

candle standing immediately beside me on the table. The object with which my mind is occupied at the moment is the topic treated of in the book; my mind is occupied with this object under the special aspect in which it is presented by the sentence I am following with my eyes. I take no notice of the lines on the opposite page or of other lines on the same page or of the margin of the page, or of the candle flame as such, or of the surface of the table, or of the clothes in contact with my skin, or of the clock which is ticking behind me. Yet all these things are producing impressions on my senses, so as to affect my consciousness in specific ways. My total experience would be altered by change or removal of these surrounding conditions. It would not be the same if I were reading by lamp-light or sunlight or twilight instead of by candle-light. It would not be the same if the book I am reading had no margin, or if the opposite page were a blank. It would not be the same if I were lying on my back holding the book in my hand instead of sitting on a chair with the book lying on the table before me. It would seem, then, that conditions of this kind produce effects in consciousness though neither these effects nor the things which produce them are attended to, noticed or distinguished. Such unnoted experiences are sub-conscious.

How, it may be asked, can the existence of the contents of sub-consciousness be ascertained at all? If they are not discerned while they are occurring, by what means do we obtain knowledge of them? The answer is two-fold. In the first place, they collectively contribute to determine our sense of our general condition and situation at the moment. They form a sort of dim background for the object of distinct consciousness. They "tell on conscious life as sunshine or mist tells on a

landscape, or the underlying writing on a palimpsest."[1] In the second place, we may become aware of the previous existence of sub-conscious contents at the moment in which they cease to be sub-conscious. When the clock stops I notice what has happened though I had not previously been aware of the ticking. But this is not all. I can also become aware at the same moment that the sound of the ticking has previously entered into my total experience without being attended to. Again, the margin of a page which I am reading, so far as it affects my experience at all, does so sub-consciously. But if I cease reading and attend to the margin, noting, for instance, that it is broad or narrow, I am aware that I am not bringing in to consciousness something absolutely new. I am aware that the presence of the margin before my eyes made a difference to my experience even before I attended to it.

In general, the distinct objects within the field of consciousness stand out in relief against a hazy and featureless background. Whenever we choose, we can turn attention to this vague background itself, so as to ascertain more precisely its nature and constitution. We then find ourselves picking out, one by one, item after item of sense-experience, previously undiscriminated. In attending successively to this or that part of the skin, we discern sensations of pressure, contact, temperature, prickling, tingling, etc., which had not been previously noted. "In the same way, attentive listening will at any time bring to [distinct] consciousness noises which would pass unnoticed under ordinary circumstances. It may be the gentle rustling of leaves, the rippling of a distant brook, the droning of insects, or in case these and all

[1] Ward, article on "Psychology," *Encycl. Brit.*, vol. 22, p. 559.

other external sounds are lacking, there is still left the sound of the blood as it pulses through the ears."[1]

In like manner, the various sensations are progressively revealed which are conditioned by the state of the internal organs, lungs, heart, alimentary canal, etc.

Now in this process of successive discernment there are two points to be observed. The first is that each item successively distinguished is apprehended, not as isolated and self-complete, but only as a partial feature picked out from a larger whole of experience, containing within its indefinite complexity innumerable other features, not as yet separately discerned. What we are aware of includes always an indefinite background which is never exhaustively analysed. The second is implied in the first. It is that each partial sensation as it emerges into distinct consciousness is apprehended, not as then coming into being for the first time, but as having in some way pre-existed within the field of consciousness before being separately discerned.

Sub-consciousness is not confined to the dim background against which discriminated sensations and images stand out in relief. The discriminated sensations and images themselves may contain sub-conscious constituents. An instance of this is supplied by the sound of an orchestra in which the listener does not discriminate the tones of the several instruments composing it. An equally good illustration is afforded by a note as played on a single instrument, *e.g.* a violin. The note is really a compound sensation, being constituted by the union of a number of partial tones which may be discerned by a trained ear; but untrained persons usually fail to detect them and distinguish only the peculiar quality of the

[1] W. B. Pillsbury, *Attention*, p. 6.

total experience, which is called *timbre*, the quality in which a note sounded on a violin differs from the same note sounded on a flute. Similarly, in rolling a peppermint on the tongue, we are aware of the resulting sensation as a whole, but we do not usually analyse this into component parts; yet it is really complex, as is readily seen when we turn attention to it in an appropriate way. It includes sensations of sweetness, of coldness, and of pungency.

In conclusion, we must consider generally the function of sub-conscious sensations and images in our mental life. Sense-experience, in general, conveys apprehension of objects other than itself—of our own bodies and of the bodies which act on our senses. How far does this hold good for sub-conscious sensations? Inasmuch as the sensations themselves are not separately discerned they do not separately convey distinct items of information concerning the external world. None the less, they have an indirect cognitive value of this kind, inasmuch as such cognitive value belongs to the whole within which they form undistinguished components. We distinguish the sound of the violin through the special quality due to the union of its partial tones, although we may not separately discern the partial tones themselves. We distinguish a peppermint, as such, from an acidulated drop, through the confused sense-experience containing sensations of coolness, sweetness and pungency, although we may not discriminate these component sensations. The like holds good for the dim background of sub-conscious sensations against which discriminated objects stand out in relief. This does not yield distinct perceptions of what exists or occurs in the external world or in our own bodies. But it does yield a general awareness of our total condition and situation at the moment. It determines the special point

of view from which we regard the world and ourselves; and it thus indirectly contributes to determine our view even of the objects of distinct consciousness.

For the rest, the nature and function of sub-conscious sensations may be characterised positively and negatively. Negatively, we can say that they form no part of the *current* of consciousness. They do not enter into the flow of presentations through which we become progressively aware of the various aspects, features and relations of an object of thought or perception. They do not call up other contents of consciousness and enter into combination with them. They do not form part of a stream of thought or train of ideas. Such change as takes place in them is due to change in the conditions affecting the organs of sense. Otherwise they remain motionless fragments. When we speak of the *stream* of consciousness we refer to distinct consciousness—to consciousness as occupied with distinct objects. Sub-conscious presentations seem rather comparable to the waves of a frozen sea. Another negative characteristic is that they lie outside the sphere of judgment or belief. We do not affirm or deny them of anything, nor do we affirm or deny anything of them. We do not even mentally affirm their existence. We have no consciousness of them which could be expressed in such words as "this," "that," "there."

Positively we may characterise them as follows. Though they are not distinctly apprehended, yet their sub-conscious presence is a condition which favours their emergence into distinct consciousness. If my attention flags in reading my book, I may begin to notice a candle-flame. The visual sensations, which had previously been sub-conscious, cease to be sub-conscious, and become separately discerned, yielding at the same time a distinct

apprehension of the candle-flame. We have described the contents of sub-consciousness as stationary in contrast to the flow of presentations. But this state of immobility is a state of tension comparable to that of a bent spring. They wait in the antechamber of attentive consciousness and keep pressing for admittance with an urgency proportionate to their intensity and to the interest of the objects which they are capable of presenting. It is evident that the more intensely a thing affects my sense the more likely it is to attract my notice. The effect of interest may be illustrated by the way in which the sight of one's own name on a printed page or the hearing of it in a conversation arrests our attention, though other words equally obtruding themselves on the eye or ear pass unnoted. Any *change* in our sub-conscious experience is especially apt to divert the current of consciousness. Thus the clock may go on ticking unnoticed; but if it stops I become immediately aware of the fact.

§ 4. The same continued.—In order that an object may be attended to, it is necessary that it should be separately discerned. The contents of sub-consciousness escape attention. But it does not follow that the inverse proposition must be true. It does not follow that whatever is separately discerned must therefore be attended to. For attention essentially consists in something more than such discernment. It consists in a felt tendency to dwell on the object so as in some way to adjust ourselves to it theoretically or practically Where there is no subjective interest leading us actively to occupy ourselves with the object, however faintly and transiently, there is no attention.

We are thus confronted with the question whether this actually occurs. Does anything ever enter distinct consciousness without at the same time, in some manner or degree, becoming an object of interest, without evoking a

mental attitude analogous to that which would be expressed in the questions—What is this? How am I to deal with this? What next? What more? Can a distinct object occupy us in any manner or degree, without our occupying ourselves in some manner or degree with it?

We may begin by confining ourselves to things and occurrences which affect our senses. The question, thus restricted, may be formulated as follows. Does the nature or intensity of an external stimulus ever of itself determine the distinct presence of an object to consciousness without at the same time eliciting a response, however faint and evanescent, in the way of subjective interest, prompting us to dwell on what is presented?

At the outset, it is to be noted that such external conditions are by no means the only factors determining which among the things affecting our senses will become distinctly presented to consciousness. The preference among the multitude of competing sense-impressions is also conditioned by our predisposition to be interested, due to the native bent of our minds and to our previous mental development. "A setter dog, for instance, has its attention drawn at once by a game bird, while a pug or a St. Bernard would hardly notice it at all."[1] A chicken notices a small grain of corn while failing to notice other things present to its senses. A cat notes and follows attentively the motions of a bird while paying no regard to buttercups and daisies and blades of grass. Other conditions being equal, a Mozart will tend to notice musical sounds rather than other sensations. The whispered name of his mistress will catch a lover's ear amid the confused buzz of louder noises which pass undistinguished by him. The sight of one's own name on a printed or written page will at once emerge

[1] Pillsbury, *op. cit.*, p. 51.

into distinct consciousness, while the other words are not separately discerned.

Other striking examples are supplied by the comparative efficacy of different sense-impressions in awakening a person from sleep. It is said that a miser may be roused from profound slumber by placing a coin in his hand where more violent measures fail. "The medical practitioner, in his first profound sleep, after a laborious day, is awakened by the first stroke of the clapper of his night-bell, or even by the movement of the bell-wire which precedes it. . . . The mother, whose anxiety for her offspring is for a time the dominant feeling in her mind, is aroused from the refreshing slumber in which all her cares have been forgotten, by the slightest wail of uneasiness proceeding from her infant charge."[1]

In such cases, the dominating condition which determines the emergence of objects into distinct consciousness is what we may call dispositional interest. There are dispositions, congenital or acquired, which are conditions of conation and feeling; and these become effective in determining the flow of conscious life, the more readily in proportion to the strength of the potential interest. If such conditions as these were the only conditions operative in determining distinct consciousness, distinct consciousness would coincide with attention.

But they are not the only conditions. There are other factors which, so to speak, obtrude objects upon us independently of the interest we take in them. These are found partly in associations formed in the course of past experience. But at present we need consider only those which are connected with the nature of the impressions affecting our senses, such as the intensity of the stimulus, its extent, or its relative novelty.

[1] Carpenter, *Mental Physiology*, p. 581.

The more intense the stimulus the more likely we are to become distinctly aware of the sensation which it occasions. A barrel organ or a German band striking up in the street immediately before an open window will, in general, force its way into the distinct consciousness of the student, however zealously he may be pursuing his studies. It is not that he is more interested in dwelling on the intrusive noise than on the problems previously occupying his mind. He will indeed be interested in getting rid of it or escaping from it, and this no doubt forms an incentive to attend to it. But such attention is secondary and derivative. The noise does not, in the first instance, obtrude itself because he wants to escape it. The reverse is the case. He wants to escape and so attends to it, because he finds it thrust upon him and maintaining itself without his leave.

The intensity of the stimulus is not so important a factor as change in intensity, and this in proportion to the degree and suddenness of the alteration. "The noise of the train upon which we are riding passes unnoticed after a short interval, while the whirl of the train which passes on the parallel line, although it does not add greatly to the din, will be noticed at once. The lighting of a candle in a dark room" compels our notice "more than the continuous glare of the sun to which we have been long exposed."[1] The classical instance is that of the miller who at length fails to have any distinct awareness of the clatter of the mill which he is continually hearing, although he notices at once its cessation or any marked change in it. What happens in such cases may be described as a victory of attentive consciousness over the obtrusiveness of the external stimulus. In the case of the miller, the persistent tendency of subjective interest is to turn away from the

[1] Pillsbury, *ibid.*, pp. 28-29.

monotonous noise of the mill and to dwell on other things. In the long run, this results in the permanent exclusion of the noise from distinct consciousness. It is driven below the threshold of distinct consciousness and passes into the field of sub-consciousness.

The extensity as well as the intensity of sense-impressions plays an important part. Other things equal, a large object, such as a big building, is more likely to be noticed than a little one; the sea is more likely to be noticed than a small pool. Other conditions connected with the nature of the external stimulus may be, in general, brought under the head of relative novelty and contrast. "A new picture on the wall, a new face at the table will draw all eyes whether there be any other striking feature or not. And also a tree in a plain, or a black face among an audience of Caucasians."[1] In general, if a man wishes "to make himself conspicuous" he can do so by presenting an appearance strikingly different from that of his neighbours, *e.g.* by wearing scarlet trousers and a yellow coat.

A very important condition of this class is the influence of motion. A moving object enters distinct consciousness far more readily and obtrusively than surrounding things which remain stationary. Objects on the extreme margin of the field of view are not usually discerned. But if such an object begins to move suddenly and rapidly, we become at once distinctly aware of its presence. This influence of movement is marked in all animals as well as in man. "Wild animals are startled by the movements of the hunter, while they fail to notice him if he remain perfectly still. . . . A horse shies when a piece of paper is blown across his path, though he would remain unaffected by the same object at rest."[2]

[1] Pillsbury, *ibid.*, pp. 49-50. [2] *Ibid.*, p. 48.

Such conditions as these have an efficacy in bringing objects into distinct consciousness which does not depend merely on their power to evoke at the same time the mental activity of attending. None the less they do also generally challenge attention. They tend to evoke an active mental attitude requiring for its development and satisfaction answers to such questions as: What's this? How am I to deal with this? What next? and so on. Hence we have to consider whether this is always the case. We have to consider whether an external stimulus may make an object separately discernible without attention immediately supervening. The problem is complicated by the difficulty of deciding when attention is wholly absent. There may be an incipient tendency to occupy ourselves with the object—a tendency which fails to develop because it is immediately overborne by other conditions. In such cases, attention may be so slight and transient that we cannot be sure of its existing at all. None the less, it would seem that we cannot regard all apparent instances of discernment without attention as really instances of faint and evanescent attention.

The best evidence is supplied by what we may call *marginal* awareness. This is a sort of borderland between attentive consciousness and sub-consciousness. When the mind is wholly pre-occupied in attending to an object, all disconnected impressions are merged in a distinctionless total experience, a sub-conscious background. But such total absorption is for most persons an exceptional state. In general, the pre-occupation is not so entire as to exclude a dim discernment of surrounding objects, which for any reason happen to be conspicuous at the moment. Such objects may, then, momentarily slip into the region of distinguishing consciousness, and then slip out again without any appreciable tendency to detain them and con-

sider them further. Thus, while my thoughts are engaged with psychological questions, as in writing this chapter, I may catch myself in the act of striking a match, and may recognise the presence of the flame and of the match-box, but without any felt tendency to occupy myself with them—to be mentally active in relation to them. They simply emerge and disappear without my doing anything to detain them.

Such marginal appearances are, for the most part, transient, and are forgotten immediately after they have vanished. But sometimes they are more persistently maintained by the obtrusiveness of the external stimulus, or some equivalent condition. For instance, in a cinematographic show our whole attention may be directed to the pictured movements of some animal; but flickering lines and spots may keep forcing themselves on our notice, apart from any felt tendency on our part to occupy ourselves with them. Again, it has been frequently recorded that in moments of intense emotion quite irrelevant and uninteresting details may be clearly discerned and permanently remembered, though they are not, in the proper sense, attended to.

It is more doubtful whether the mind is ever in a state of complete inattention, so as to be occupying itself with no object at all. It may be thought that there are states of idleness in which one thing after another flits before our mental view without our concerning ourselves even faintly and transiently about any of them. "If I am sitting at ease, with my mind not dwelling, as we say, on any subject, but wandering aimlessly as I regard some well-known scene, I am what everyone would call inattentive generally. If we keep to ordinary language, I am not attending here to anything at all."[1]

[1] Bradley, "On Active Attention," *Mind*, N.S., vol. xi., p. 2.

But we have to remember that ordinary language aims, not at scientific precision, but only at a measure of accuracy sufficient for the practical purposes of daily life. Thus, when we say that water is "pure," we do not commonly imply that it is absolutely unmixed with anything else, but only that it is pure enough to drink without misgiving. The meaning is that it conforms to a certain practical standard of purity.

Similarly, in ordinary language we may speak of inattention in cases where there is not a complete absence of attention, but only a comparative absence. Thus, we say that a man is inattentive when his mind skips easily from one object to another without steadily or seriously dwelling on any of them. But we ought rather to say that the man is giving slight and brief attention to each in turn—that attention is disjointed and volatile rather than absent altogether. This may happen even when the several objects have no specific interest for him. For, besides specific interests, there is a general interest in being mentally occupied in some manner or degree. It is this general tendency to be mentally active which makes us feel bored when it is denied satisfaction.

A much closer approach to complete inattention is found in certain cases of mental disease. In some stages of mania, the patient ceases to notice surrounding objects, and it is impossible to make him answer questions. A sequence of ideas goes on in his mind, but it is utterly disjointed and incoherent. As soon as he has begun to think of one thing he rushes off to another. Between any two immediately successive ideas, A and B or B and C or C and D, there is discernible some link of connexion, but there is none between A and C or between B and D. Further, even the connexion which is discernible is of the most superficial kind, such as accidental similarity in the

sound of words apart from their meaning. The mind seems hurried on by the play of casual associations without any power of active self-direction. Here, if anywhere, the total mental state may be said to be one of complete inattention.

§ 5. **Attention to Displeasing Objects.**—The mind tends to occupy itself with unpleasing, as well as with pleasing, objects. Bad news as well as good is attended to. Now it is a fundamental law of our mental life that we seek to avoid, alter, or abolish what is disagreeable to us and to maintain only what is agreeable to us. Ought we not, in accordance with this principle, invariably to disregard and dismiss disagreeable thoughts and perceptions instead of actively occupying ourselves with them? This difficulty disappears when we consider that, for the most part, we cannot get rid of what displeases us merely by refusing to think about it. If we lose our ticket when on a railway journey, we cannot arrange the disagreeble situation to our satisfaction merely by dismissing it from our minds and thinking about something else. Active adjustment of some sort is required and this involves attention. If, in trying to solve a problem, we find ourselves obstructed by a difficulty, the difficulty is not removed by ignoring it. Similarly, if we are separated by death from a beloved friend, the separation would only be rendered more complete if we did not cling to the memory and imagination of him.

None the less, in so far as the act of attending to a disagreeable object is itself disagreeable, there will be a tendency to turn from it to other and more pleasing matters. The degree in which this tendency is efficient in controlling the direction of thought depends on the degree in which it is counteracted by other motives. This varies in different cases and for different individuals. One person, finding the sight or the thought of the misery of others painful to

him, simply turns aside from it and as far as possible ignores it. In another, the impulse to relieve distress is so powerful that the subject persistently absorbs his attention. One person finding a problem difficult will immediately give it up, whereas the same difficulty presented to another mind will arouse it to more vigorous activity.

From this point of view, we can broadly distinguish two types of character, the frivolous or pleasure-seeking and the serious or strenuous. In the first, the prevailing tendency is to evade and ignore what is displeasing. In the second the prevailing tendency is actively to grapple with it so as to remove or amend it. Harold Skimpole in *Bleak House* belongs to the first type. "All he asked of society was to let him live. . . . Give him the papers, conversation, music, mutton, coffee, landscape, fruit in the season, a few sheets of Bristol-board, and a little claret, and he asked no more. . . . He said to the world, 'Go your several ways in peace! Wear red coats, blue coats, lawn sleeves, put pens behind your ears, wear aprons; go after glory, holiness, commerce, trade, any object you prefer; only—let Harold Skimpole live. . . . Suffer him to ride his rocking horse.'" We are told that he had "composed half an opera once, but got tired of it"—a very characteristic trait.

As an example of the opposite type we may take Napoleon. Napoleon was no doubt ambitious and selfish. But he was not a pleasure-seeker. His aim was not to enjoy the world but to shape and mould it in accordance with his desires. Conditions which would have formed a paradise for Skimpole would have meant misery for him. He was incessantly consumed by an intense craving for work—the harder the better. His pleasures and pains were the pleasures of success and the pains of failure. If he had written half an opera, he might have grown tired of it; but he would certainly have finished it.

§ 6. **Unity and Continuity of Attention.**—If a varying number of points, lines, numbers or letters be momentarily exhibited before the eye, it is found that "only a limited number can be simultaneously discerned so as to be counted after they have been momentarily seen."[1] Only about five separate points or lines or numbers or letters can be so discerned. Limitation of this kind is called limitation of the span of attention. Now it is often said that we can attend to only one thing at a time. Is this position refuted by the experiment with momentary exposure? Do not the experiments show that, in certain cases, we can attend to at least five distinct objects at once? Undoubtedly they do show this. But they do not show that the distinct objects can be separate objects in the sense of being disconnected with each other. The several points, lines, or numbers are not apprehended in isolation, but as distinguished from each other and as forming a numerical group. This holds good as a general principle; wherever we attend to many things at once, we attend to their interconnexion, so that our total object is a single whole. It is single though not simple.

This applies even to extreme cases of what is called divided attention. When a person writes one letter and also simultaneously dictates another, there is, no doubt, an oscillation of the mind between the two tasks, inasmuch as attention is specially concentrated now on the one and now on the other. But, even during concentration on the dictated letter, the written letter does not wholly slip out of the field of attentive consciousness. The total object is the problem of writing the one letter while keeping in mind that the other has to be dictated. If we add that when a sentence has been mentally prepared the actual writing or

[1] Myers, *Text-book of Experimental Psychology*, p. 321.

speaking may proceed automatically without further attention, we seem to have a fairly satisfactory account of what takes place. Of course, feats of this kind are quite exceptional.

The partial features of the total object are apprehended successively as well as simultaneously. Here also experiments have been made on the span of attention. When the momentary sounds caused by taps succeed one another regularly every quarter of a second, the subject can just apprehend groups of eight. "If one group (the first member of which is accentuated by a bell) consists of eight taps, while another group (similarly accentuated) consists of seven taps, the subject can, without counting, distinguish the one group from the other; but beyond groups of eight taps his judgment becomes unreliable."[1]

This successive discernment of the partial features of a single object in relation to each other is especially characteristic of attention. We are mentally active in making the object gradually disclose its nature and relations with increasing fulness of detail. This is what is meant by saying that attention consists in a felt tendency to dwell on the object so as to *develop* it—to unfold or unroll it.

The development may take place in various ways and by various means. It may consist in the successive discernment of items, already sub-consciously present, as when we distinguish within the total sound of an orchestra the separate notes of the instruments. It may involve the getting of new sensations by active movements of the body and of the organs of the special senses, as when a shop-keeper tests a suspicious coin by looking at it, biting it, and ringing it on the counter; and, generally, in all observation of material objects. Where, in the pursuit of ends, we

[1] Myers, *ibid.*, p. 322.

produce changes in our environment, these changes and their foreseen results form part of our total object, the attainment of the end we are aiming at. In all cases, there are processes of interpreting, identifying, classifying, recognising, etc., by which the object is brought into relation with the results of previous experience as retained and organised in pre-formed mental dispositions. In this way what is fragmentary in it is supplemented and expanded, links of connection are supplied for its relatively unconnected parts, and the whole is fitted into its place in the pre-acquired system of knowledge, belief and imagination.

The general name applied by psychologists to such processes is Apperception. Apperception is involved in all distinct perception and especially in all attentive perception. When we see the wet ground, its wetness is not an original datum of sight, but one of touch. Its connexion with a peculiar visual appearance has been learned in previous experience. When a thing looks smooth, all that is given merely through visual sensation is the lustre or sheen of the surface; the smoothness is primarily perceived by touch and comes to be connected with the visible appearance through association. In general, when we look at any thing only one side of it is visible, the other side is not seen but suggested. When we say that we hear someone's footstep on the stair, all that we are aware of through the ear alone is a sound of a certain kind; that the sound is due to a footstep, that the footstep is that of some particular person, and that it is on the stair, all this is an interpretation based on previous experience.

These are obvious cases; but it is a main part of the business of psychology to show the same process at work where it is by no means so obvious, to show how very little, comparatively speaking, can be ascribed to the original data of sense and how much is due to apperception. One

instance of this may be given here by way of illustration. In reading, only a very small proportion of the printed matter is brought within the area of distinct vision so that the shape of the letters can be directly recognised. "Erdmann and Dodge proved that the eyes in reading do not move constantly and smoothly over the line, but go by a series of short movements with rests between." The individual letters are discernible only when the eyes are at rest. "It is quite easy to determine from the length of the line and the number of rests, the number of letters which are read at a single glance. It was found that this was considerably greater than the number that could fall at one time on the area of the retina sensitive enough to permit them to be read. The other letters must, it is evident, be supplied by association from the material gathered in earlier experiences." [1]

Apperception may take place easily and rapidly, or it may involve a more or less complex and prolonged process. It is easy and rapid, for the most part, in the case of familiar things in familiar surroundings. It is longer and more complex where the object is comparatively unfamiliar or is presented in a novel situation. The same is true even for the familiar, when our general mental development has raised new questions concerning it so that we apprehend it in a new light. Before a man has learned geology a stone may immediately find its place in the general context of his experience. But after he has become a geologist, hours of study may be required to adjust it to his new system of ideas. Now, the more readily and rapidly apperception takes place the less attention it requires, and the more difficult it is the more attention it requires. Where there is not sufficient interest in developing the

[1] Pillsbury, *ibid.*, pp. 117-118.

object, apperceptive processes, otherwise possible, fail to occur.

In general, attention has a two-fold function in the development of objects; in attending we seek to mark and keep distinct from each other the various parts and aspects of the whole with which we are dealing; and at the same time we seek to apprehend more fully and clearly the interconnexion of these distinct features within the unity of the whole. Both the distinctions and the relations are ultimately founded on the nature of the object. But, in part, they may be introduced or at least emphasised in other ways depending on our own initiative.

This is well illustrated by the way in which we tend almost irresistibly to introduce a rhythmic grouping in series of impressions recurring monotonously at regular intervals. Thus, in listening to the ticking of a clock we accentuate alternative ticks, so that what we apprehend is not tick, tick, tick, etc., but tick-tack, tick-tack, etc. Similarly, in attending closely to a group of dots or lines we tend to divide them mentally into smaller groups having a definite arrangement, although their actual distribution may be indifferent to the order which we give them.

Another way in which we may introduce an order and distinctness into the object, which is not directly found in its own nature, is by transferring to it the character of some other object more or less like it. This is the method used in illustrative metaphors and similes. The stars are distributed in more or less distinct groups; but the human mind has increased for its own apprehension both the internal unity of each constellation and its distinctness from the others by assimilating them to the figures of well known animals and other familiar objects: the

Great Bear, the Little Bear, the Wain, etc. But the most important artifice of this nature is the use of arbitrary marks or signs. The robber in the Arabian Nights applied this device when he made a chalk mark on a door to mark off a particular house from other houses similar and similarly situated.

All use of language comes under this head. In attaching names to objects of thought we fix for permanent reference both their internal unity and their distinction from each other. The permanent possession by the mind of a complex idea as part of the current coinage of thought depends very largely on whether it has a name annexed to it or not. Thus, as Locke remarks, "killing a man with a sword or hatchet are looked on as no distinct species of action; but if the point of the sword just enter the body, it passes for a distinct species; as in England, in whose language it is called stabbing." Though the complex object may in the first instance be apprehended without the name, yet the name is "the knot which ties its parts fast together.[1]

The unity thus imposed by subjective activity always presupposes some unity in the nature of the object itself. Such unity may vary greatly in kind and degree; but in all cases it is clearly distinguishable from any of the parts combined or all of them together. The relation or form of combination has always to be considered as a separate factor, giving a specific character to the whole. "By transposing a tune from one key to another, we may obtain two entirely diverse aggregates of notes, and yet the melody may remain unchanged. On the other hand, by varying the order of the notes two distinct tunes may result from the same collection of

[1] Locke, *Essay on Human Understanding*, Book III., Ch. 3, § 10.

tones."[1] The same holds good for the interval between any two notes. There may be the same interval between different pairs of notes, or a different one between the same notes when their order is inverted: and in either case the whole complex is different.

Similarly, the metrical form of a sonnet or of a hexameter line may remain identical though its component words and syllables may be varied throughout; a red triangle on a green background has a formal identity with a blue triangle on a yellow background; the general form of a syllogism in Barbara remains the same in spite of variation in its terms. The progression 1, 2, 4, 8, 16, etc., is identical in its form of unity with the progression 3, 6, 12, 24, etc. The gradual fading of a blush is formally akin to the gradual dying away of a sound.

A complex whole as characterised by its specific form of unity has attributes which do not belong to any or all of its parts; and inversely the parts may have attributes which do not belong to it. A heap of stones may be a pyramid, though no single stone is a pyramid; each stone may be round, though the heap is not round. An animal may pursue or lie in wait for its prey; but we cannot say that the animal's legs or head or tail pursue the prey or lie in wait for it. A triangle is a closed figure. But its lines or angles are not closed figures. It is above all important from the psychological point of view that a whole object in its unity has a distinctive function and value as a factor in mental process, different from that of its parts. A melody yields a pleasure which is not due to its component tones considered apart from their union. The same holds good of pleasing combinations of colours or

[1] Ward, *Encycl. Brit.*, vol. 22, p. 593.

lines or movements. The line "Thoughts that do often lie too deep for tears" affects our sensibility in a peculiar way; but if we take away any of the component words, or alter their order, the effect is lost. Similarly, a discord is displeasing when the discordant tones are in themselves pleasing.

Again, an object as a whole has associations which do not belong independently to its parts, and so may call up ideas which its parts fail to recall. Certain lines drawn on paper may in their union irresistibly suggest a man swimming in the sea, whereas they have no such effect severally. They have no such effect even when they are all apprehended, if they are not apprehended in the right order and combination. This is well shown in puzzle pictures, where a figure may, in a sense, be before our eyes for a long time before we are able to see it. The several constituents, or *disiecta membra,* are all perceived. But they do not suggest *e.g.* a man swimming until they are detached from their other relations within the picture and apprehended in a special connexion with each other. To take a simple instance, the word "man" as a whole calls up the idea of "human being," but no such association attaches to its several letters or to all of them together unless they are united in an appropriate way.

The unity of a complex object varies greatly in degree, according to the nature of the object. Any closed figure, as such, is a unity; but a regular figure is more so than an irregular figure; for its parts are combined according to a uniform rule of construction. For the same reason a line of verse, in virtue of its metrical form, has more unity than a line of prose. A concord is a more intimate unity than a discord. An army has more unity than a mob; and an army with a leader has more unity than an army without a leader.

It is the function of attention to bring to light whatever unity may be inherent in the nature of its object. This process of discovery is often prolonged and gradual, each stage preparing the way for the next. Planets, for instance, move round the sun in regular periods: but in what precise path and according to what precise rules? The intense and prolonged attention of Kepler discovered answers to these questions, which are formulated in his three laws of planetary motion. Planetary motion was throughout his single object: and it was in the development of this object, so as to define more fully and precisely the kind and degree of unity belonging to it, that he discovered his three laws.

§ 7. **Continuity and Diversion of Attention.**—In continued attention we are constantly turning to relatively new objects, *a*, *b*, *c*, *d*, *e*, *f*, etc. None the less, there is a single attention-process so long and so far as we occupy ourselves with each successive item as being a partial phase or feature of one and the same whole, and with its relation to other preceding and following items as forming part of the unity of the whole. If, on the other hand, a new object arises which is not thus viewed in relation to previous items as a further development of the same theme or topic, so that we can drop reference to the previous items and make a fresh start, so far as this is the case, attention is said to be *diverted*. In the moment in which the diversion is taking place, there is, in a sense, continuity of attention, inasmuch as the mind is aware of both objects at once in being aware of the passage from one to the other. In making the step from the first to the second it has, so to speak, one foot in both. But as soon as the diversion has taken place, this kind of continuity ceases. The previous object is lost sight of in the development of the new. Such continuity may be called

Temporal Continuity of Attention, inasmuch as it depends merely on the coincidence in time of the end of one attention-process and the beginning of another. On the other hand, the connexion of successive steps within the same attention-process may be called Continuity of Interest or Conative Continuity, inasmuch as interest is throughout directed towards the development of a single total object.

Suppose that, while playing chess or whist, I am suddenly called away at a critical stage of the game to meet a visitor on a matter of business. The interruption, as such, constitutes a relation between the state of consciousness which is interrupted and that which interrupts it. But this relation exists between otherwise disconnected attention-processes, and depends on the temporal coincidence of the end of one with the beginning of the other. If, on the contrary, we consider the successive phases of the process of making up the mind about the move at chess, or of settling the matter of business, we find a different and more intimate kind of continuity—continuity of aim or purpose, continuity of interest. From this point of view, my state of mind when I have finished my business with the visitor and returned to my game is continuous with my state of mind when I was interrupted, rather than with the intervening flow of consciousness. The very word *interruption* implies this. It is clear, then, that continuity of interest is more or less independent of direct proximity in time. This kind of continuity is essentially connected with mental activity in the strict sense, with the striving, conative, appetitive side of our nature. Its general condition is that the successive phases of a conscious process shall constitute a movement towards an end-state or terminus. As we have already explained (pp. 123-4), an end-state or terminus is a state

of consciousness in which the process finds its natural termination—the termination prescribed to it by its own nature, and not by extraneous conditions. Each phase of the process before the end is reached is incomplete, and tends by its own inherent constitution to pass beyond itself. If the activity is displaced by a disconnected process before it has attained its goal, it tends spontaneously to recur after the interruption and work itself out, starting from the stage at which it was cut short. If, while it continues to occupy consciousness, its progress is in any way checked or arrested, an experience of dissatisfaction or unpleasantness arises. So long and so far as its progress is unchecked, but not yet completed, consciousness is unsatisfied, but not dissatisfied, and *ceteris paribus* the experience is pleasant.

Conative unity at any one moment depends upon conative continuity at different moments. If we take any momentary phase in the flow of conative process, we find a total state of consciousness in which some constituents are irrelevant to the main direction of thought, and others are essentially concerned in its progress. Thus, in playing a game of chess the modifications of consciousness due to impressions from surrounding objects are irrelevant to the main current of consciousness. Only the experiences connected with the position of the pieces on the board are relevant, and only these experiences are embraced in the conative unity of consciousness. This distinction corresponds broadly to that between attentive consciousness and sub-consciousness.[1]

The total process of attentive consciousness is, in general, composed of a succession of processes, each of which has a certain conative continuity. Some of these

[1] Discussed in § 3 of this chapter.

may be very transient and involve only a slight and evanescent interest. But in so far as they involve attention at all they are essentially conative. Even when the mind rambles from object to object in a desultory way, its slight and transient occupation with each in turn involves, in general, some degree of interest. Thus the transitions which are without conative continuity are usually transitions from one conative process to another. But even in these transitions there is a kind of continuity, inasmuch as the end of one process coincides with the beginning of another. In the moment of interruption, the interruption itself constitutes a sort of continuity between the old process and the new.

Both temporal continuity and continuity of interest are of great importance in the general development of mental life, as conditioning in different ways the formation of mental dispositions and associations.

§ 8. **Gradations of Conative continuity.**—The continuity of interest connecting the successive phases of an attention-process may have various degrees. The possibility of this lies in the fact that the continuity may exist in certain respects and not in others. The succeeding phase may be only in part a development of the preceding phase and in part disconnected and relatively independent. Compare the process of learning a proposition in Euclid by heart with that of intelligently following the demonstration. For the boy who learns by rote, the proposition is only a collection of sentences arranged in a certain external order on the page before him; these sentences have continuity of interest for him mainly because they have to be repeated by him in the same order when he is called on to do so by his teacher. If the order of the sentences were altered in any arbitrary manner interest and continuity of interest would be unaltered, if he still

supposed that the given order was authoritative. It is quite different with the boy who follows the reasoning. In his case it is not only the external sequence of the sentences but the logical development of the meaning which is interesting. Each step has interest for him only through its connexion with what precedes and follows. If the order of the sentences were arbitrarily altered this logical continuity would be destroyed. So far as he is interested in the logical development, the separate sentences have no independent existence for him. They come before his mind *only* as transitions in the evolution of a continued interest towards its satisfaction.

The stream of consciousness consists of successive trains of mental activity each having its own internal continuity of interest, but relatively disconnected with each other. It must be noted, however, that in the case of normal human beings the disconnection of the successive segments is only relative, not absolute. The successive segments of the conscious stream have also some degree of continuity with each other. This does not hold good, save in a very rudimentary way, of animals. The mental life of the animal seems in the main to be composed of a series of detached and independent impulses. But in human beings the sequence of special conations is more or less unified in a comprehensive scheme. There is a thread of continuity running through their whole mental life. This more comprehensive unity is, in essence, akin to the special unity of the successive portions of the stream of consciousness. It simply means that the ends of conscious life are connected in a system, so that the satisfaction of special interests is also the partial satisfaction of more general interests, and the attainment of this or that result forms a step towards the attainment of others in progressive order. In sitting down to read the morning

paper I begin with a general interest in acquainting myself with current news. In passing from item to item I gratify special and relatively detached interests. But these interests are only relatively detached. They are connected in so far as they form special parts of my general interest in learning the news. This interest again is part of the still more comprehensive interest I have in keeping myself in touch with my fellow-men so as to know what they are thinking or talking about. Again, my special interest in such a topic as Tariff Reform is a particular case of my general interest in politics and more especially in the position and prospects of my own country.

This interweaving of interests in a system constitutes the unity of personal life as opposed to the impulsive life of animals.

Plainly, the unity of consciousness, as constituted by unity of interest, may exist in very varying degrees. The mental life of such men as Hegel, or Comte, or Bismarck, or Newton, forms a far more systematic unity than that of the man in the street. The mental life of the civilised man is, in general, more completely unified than that of the savage; and the mental life of man has a unity which is not found in the animal. But some kind and degree of conative continuity must be present, wherever there is anything which can be called mental development or learning by experience. Where there is no conscious striving there can be no self-fulfilment and self-development of conscious striving. Hence we may say that unity of consciousness as constituted by continuity of interest is at once an indispensable starting-point and a progressive achievement of mental evolution in the strict sense, of that kind of development which is peculiar to conscious beings as such.

§ 9. **Expectant Attention.**—All attention is, in a sense, expectant or prospective. In seeking the development of our object we look forward to the appearance of new features and relations belonging to it, which are not yet apprehended. In proportion to the unity of our total object and the degree of our interest in it as a whole, whatever is thus included in it or related to it will tend to occupy the mind in preference to disconnected objects which might otherwise be suggested by sense-impressions or irrelevant associations of ideas.

The term Expectant Attention is specially applied to a particular form in which this general principle operates. It is applied to the special case in which something is already more or less definitely anticipated in idea, but requires for its further development an actual sense-perception. When this is so, we notice what we are expecting in preference to other things. "It is much easier to see any lost article if you have a definite picture of what is sought. In fact, searching for anything consists ordinarily of nothing more than walking about the place where the object is supposed to be, with the idea of the object kept prominently in mind, and thereby standing ready to facilitate the entrance of the perception when it offers itself."[1] In order to pick out a weaker tone from a simultaneous group of stronger tones, we must first set before our minds the idea of the weaker tone and then listen for it amongst the stronger tones which would otherwise mask its presence from us. "The practised microscopist, while applying one of his eyes to his instrument . . . can keep his other eye open, without being in the least disturbed by the picture of the objects on the table which must be formed upon its retina."[2]

[1] Pillsbury, *ibid.*, p. 36.   [2] Carpenter, *Mental Physiology*, p. 137.

Such expectant attention is frequently a source of illusion. We see what we expect to see instead of what is really present. If we expect to meet A at a certain place and time and B appears instead, we are likely to mistake B for A; we tend to apperceive the given sense-impression through the wrong group of mental dispositions and so to misinterpret it. "During the conflagration at the Crystal Palace in the winter of 1866-7 . . . , it was supposed that the chimpanzee had succeeded in escaping from its cage. Attracted to the roof with this expectation in full force, men saw the unhappy animal holding on to it, and writhing in agony to get astride one of the iron ribs. . . . But there was no animal whatever there; and all this feeling was thrown away upon a tattered piece of blind, so torn as to resemble to the eye of fancy the body, arms, and legs of an ape."[1] Where what is attentively anticipated is movement, or something producible by movement on the part of the person attending, there is a tendency to make the movement. When a number of persons sit at a table, on which they place their hands, expecting it to rotate, they involuntarily exert lateral pressures which give rise to the kind of motion anticipated. This may or may not be a complete explanation of table-turning. But the fact that the sitters do unconsciously push or pull is demonstrated by experiments of the kind first devised by Faraday, who used as indicators levers so contrived as to move in the opposite direction to the table under lateral pressure from the hands of the sitters.

Expectant attention also influences the order in which sensuous presentations are discerned, when the stimuli affect the sense-organs simultaneously. *Ceteris paribus*, "for a flash of light to be perceived earlier than a

[1] Quoted from Dr. Tuke by Carpenter, *ibid.*, p. 208.

momentary sound, the light must precede the sound by from 60σ to 100σ [thousandths of a second]; when this interval falls to about a quarter of this value the sound is 'perceived' before the light."[1] But the direction of the subject's attention makes an important difference. In one case, for instance, it was found that when expectant attention was directed to the expected sound, "the latter apparently preceded the light stimulus, when actually it followed by an interval of about 50σ."[1]

§ 10. **The Efficiency of Attention.**—In attending, we seek to apprehend our object more adequately and distinctly. But the efficacy of the attention-process in producing this result is only partially dependent on the degree and duration of attention. It depends also on the nature of the object and on the degree in which similar objects have occupied the mind in the past. We may make prolonged and strenuous efforts to discover the nature of a thing seen dimly in the distance, to determine, for instance, whether it is a man or an animal, a rock or a tree; yet in the end we may still remain in doubt and perplexity, although we should have had little difficulty with it, if it had been nearer to us. The persistent and intense study of an involved and clumsy exposition of an intricate subject may leave us hardly any wiser than we were before, whereas a simpler subject more lucidly expounded would have been understood at a single reading. It is harder to bring before consciousness in their distinction and relation a series of nonsense syllables, than the same number of words with meanings; and if the words are connected in an intelligible context the work of attention is still further facilitated.

The influence of prior attention in making subsequent

[1] Myers, *ibid.*, p. 315. [2] Myers, *ibid.*, p. 315.

attention to the same or kindred objects more effective is of fundamental importance in the development of our mental life. Apart from forgetfulness, the general principle is that the results of previous attention-processes are carried forward into subsequent process and constitute a basis for further operations, so that the mental work which has been already performed does not need to be done over again.

It is to the habitual direction of attention that we must ascribe all special power of discriminating and interpreting sense-impressions which does not depend on superior delicacy in the organs of sense. A savage will discern a snake from a withered branch, or distinguish and identify an animal in the distance, where a civilised man entirely fails. But careful investigation has failed to show any superiority in the eyesight of the savage. His greater power of discrimination in certain directions is due to practice beginning in childhood and continued throughout his life. The same savage who can track game where his white companion can discern no trace of it would be reduced to tears and despair if he were condemned to pick out the inverted s's on a page of print.

The special development of touch discrimination in the blind, shown for instance in their reading of raised print, is also due to the habitual direction of attention to tactual impressions. Where hearing as well as sight is absent, as in the case of Helen Keller, it has been found possible to acquire the power of following oral speech intelligently by touching the lips and throat of the person speaking.

In many trades and professions special aptitudes of the same kind are acquired by special training. "The steel-worker sees half a dozen tints where others see only a

uniform glow."[1] The seaman "makes out the distinct 'loom of the land' where the landsman can detect nothing but an indefinite haze above the horizon line." The wine-taster "can tell the vineyard by which any particular choice wine was yielded and the year of the vintage which produced it."[2]

§ 11. **Movements of Fixation.**—The direction of mental activity towards an end involves the tendency to use whatever means may be found conducive to the attainment of the end. This applies to attention as a striving after the fuller apprehension of its object. When we are trying to make out the form, colour and movements of a bird, we may use a field-glass to give us a clearer and more detailed sight of it. The field-glass is an artificial contrivance expressly devised for this purpose. But there are other and more primitive means provided, from the outset, in the constitution of our own body and organs of sense.

Thus, when we are interested in something which is present to our senses, there are various movements by which we can actively obtain sense-experiences from it, so as to make our apprehension of it more full and distinct, and by which we can exclude the disturbing effect of irrelevant impressions. There are, in the first place, special movements of adaptation of the sense-organs for the receiving and detaining of sensations. When something in the field of vision catches the attention, the eyes normally turn towards it, so that we look directly at it. The ocular movements are such as to bring what is seen within the area of distinct vision for each eye and for both at once. Besides this, there is accommodation of the lens of the eye so as to obtain a clear image on the retina.

[1] Ward, *ibid.*, p. 555. [2] Carpenter, *ibid.*, p. 142.

When the thing seen is so large that we cannot make the requisite adjustments for all of it at once, we follow its outlines with our eyes, bringing its parts successively within the area of distinct vision. Such movements are to some degree acquired in the course of individual experience; but to a large extent they are provided for by the original constitution of the nervous system.

To evoke the ocular movements of adaptation it is not necessary that the object attended to should be itself within the field of vision. "In attending to impressions from other sense-organs, the eyes are adjusted to receive the impression even if it is dark, or there is some other condition which prevents the object from being seen. An excellent instance of this can be obtained by watching a man trying to attend to two tuning forks held one before each ear. As the attention turns from fork to fork there is an accompanying movement of the eyes from side to side in the most striking manner, in spite of the fact that the forks are held in such a position that it is impossible to see either."[1]

Special adjustments occur in the case of other sense-organs as well as in that of the eye. The moving hand explores the surface touched so as to ascertain its shape and texture. Even before actual contact, when "the question whether a surface is rough or smooth comes into the mind,"[2] there is a tendency to move the fingers towards the surface, if it is within reach. In listening we turn our heads so as to be in the most favourable position for catching the sound; and there are also probably special adjustments within the ear itself, though their nature is obscure.

In attentively tasting, we roll the morsel on the tongue

[1] Pillsbury, *ibid.*, p. 16. [2] Pillsbury, *ibid.*, p. 16.

and press it against the roof of the mouth. In attentively smelling, we sniff the air.

It has been held by some psychologists that these adaptive motor activities really constitute the process of attending to perceived objects instead of being the means or instruments for making attention more effective. But this position seems quite untenable. In the first place, though adaptive movements of the sense-organs *usually* accompany attention to sensuous presentations, it is by no means necessary that they should always do so. It is quite possible to attend to sensations in the margin of the field of view without bringing them into the area of distinct vision. It is quite possible to attend to purely passive touches. In the second place, the suggested view puts the cart before the horse. The movements of adjustment are normally determined by previous attention to the object instead of being prior to it. This point is well brought out by Pillsbury. The only condition "for the occurrence of the movement is that an object catches the attention, and as soon as it attracts the attention, the movement which is necessary to give the most favourable condition for" observing it "follows at once."[1]

Besides the special adjustments of the special sense-organs used in the perception of an object, there is also in strenuous attention a general posture of the body as a whole, for excluding or weakening the influence of irrelevant sense-impressions. There is a convergence of all movements towards the one end of fixing and detaining those sense-impressions which are relevant to the attention-process, and there is a tendency to suppress all other movements. In intent listening or looking, locomotion ceases,

[1] Pillsbury, *ibid.*, p. 14.

and we stand fixed in a tense and motionless attitude. There is sometimes even an involuntary holding of the breath.

Another highly important way of fixing attention on a perceived object is by imitating its behaviour. There are, as we shall see later, many kinds of imitation. But the most primitive is a direct consequence of the principle that attention to a movement involves a tendency to make the movement ourselves. This tendency may be and for the most part is suppressed by counteracting conditions: but where opposing influences fail to operate, as when attention is entirely absorbed in following the movement of an object, independently of other interests, it manifests itself in obvious ways. This is illustrated by the case of the spectators at an exciting football contest, "where there is a marked tendency of the whole mass of observers to follow the movements of the players with their bodies. In some moments of excitement the entire body will move forward in complete unconsciousness of the fact that any movement is being made. . . . And in most cases the whole crowd will have changed its position very considerably without being conscious that a step has been taken."[1] Imitation of this type arises directly out of the attention-process and is at the same time a means of increasing its efficiency inasmuch as it yields more full, vivid, and definite apprehension of the object imitated. It is mainly in this way that young children and animals learn by imitating the actions of others.

We have considered the means of aiding and facilitating attention to objects which are present to the senses. There are also special ways of fixing attention on mental images and ideally represented objects. But the treatment of

[1] Pillsbury, *ibid.*, p. 10.

these may be postponed to a later stage, when we come to deal with imagery, ideas, and the use of language.

§ 12. **Kinds of Attention.**—There is an important distinction between (1) immediate and (2) derivative attention. The schoolboy studying the unattractive pages of his Latin grammar for the sake of winning a prize illustrates the second form. His total object is not Latin grammar merely, but Latin grammar considered as something to be learned with the aim of gaining a prize. He has little or no interest in mastering the contents of his book for their own sake, and he would not concern himself with so dry a subject except as a means to an ulterior end. On the other hand, if his thoughts wander off to such themes as cricket or football, his attention is of the immediate or spontaneous type. Cricket and football have for him a direct interest of their own independently of their being means to some end otherwise disconnected with them in its nature.

Another distinction closely allied to this is between volitional and non-volitional attention. Attention is volitional when it is initiated by a voluntary decision or resolution to attend to a certain topic rather than to others. This pre-supposes that the mind starts, not merely with the thought of the topic, but with the thought of giving attention to it as a deed to be performed. Where there is no such preliminary idea of attending and consequently no express decision to attend, attention is non-volitional. Plainly, when the boy's thoughts leave his book and turn to cricket, their direction is not determined by any express volition on his part. On the contrary his study of Latin grammar most probably did require to be initiated by a voluntary decision. In all likelihood, he went through some such process as the following, "I should like to read this story or to 'do stamps,' but, as I want to win that prize, I shall fag away at my grammar instead."

We cannot however simply identify volitional with derivative attention and non-volitional with immediate attention. A person may deliberately decide to give his attention to a theme which thereafter occupies his mind merely through its intrinsic interest. The boy, for instance, might voluntarily decide on "doing stamps" instead, or reading a story. But his sustaining interest in "doing stamps" might none the less be direct and not derivative.

CHAPTER III.

PRIMARY LAWS OF MENTAL PROCESS.

§ 1. **Retentiveness.**—Retentiveness in some form is an indispensable condition of development or progress of any kind. Advance would be impossible unless the results of prior process persisted as the basis and starting-point of subsequent process. In marching, each step has its point of departure from the new position secured by the previous step. In marking time there is continual reversion to the same position and no advance. No house could be built if each brick vanished as it was laid, and had to be replaced anew. A rope cannot be formed of dry sand, which crumbles away as it is put together. Similarly, mental development would be impossible unless previous experience left behind it persistent after-effects to determine the nature and course of subsequent experience. These after-effects are called, in psychology, *traces* or *dispositions*, and the psychological law of retentiveness may be stated as follows: *when and so far as mental development takes place through mental conditions, it does so because specific experiences leave behind them specific traces or dispositions, which determine the nature and course of subsequent process, so that when they are modified it is modified.*

The persistence of dispositions is not absolute; they tend to decay, and may perhaps disappear altogether if they are not maintained by renewal of the corresponding mental processes, or of mental processes connected with these. In

this respect there is a great difference between different individuals. Some are more retentive than others. But even in the most retentive minds, traces tend to fade away: "so that if they be not sometimes renewed by repeated exercise of the senses, or reflection on those kinds of objects which at first occasioned them, the print wears out, and at last there remains nothing to be seen." Thus the experiences, "as well as children, of our youth, often die before us; and our minds represent to us those tombs to which we are fast approaching, where, though the brass and marble remain, yet the inscriptions are effaced by time, and the imagery moulders away."[1] The differences in the retentive power of individuals are, in part at least, differences in original endowment, and cannot be explained on psychological grounds. As Locke remarks, some minds retain the characters drawn on them "like marble," others "like freestone," and others "little better than sand." The ultimate explanation of this difference in original endowment must take a physiological form.

§ 2. **Retention involves Retention of Presentations.**— I have already laid stress on the distinction between objects which are immediately experienced and those which are not. Objects which are immediately experienced we agreed to call presentations, and we referred to sensations and mental images or copies of sensations as the most obvious examples of what is meant by a presentation. A pressure-sensation or a sound-sensation, for example, actually exists only in the moment in which it is actually being experienced. To adopt a phrase of Berkeley's, it exists only in the mind.

On the other hand, in being aware of a pressure-sensation we also are cognisant of something which presses, and

[1] Locke, *Essay on Human Understanding*, Book II., Ch. 10, § 5.

in being aware of a sound-sensation we mentally refer to something as its source. In general, the apprehension of immediate experiences in the way of sensation carries with it the apprehension of objects which are not immediately experienced—objects which are thought of as having a being independently of what passes in our mind in the moment of our becoming cognisant of them.

Now it is clear that originally our awareness of other objects is conditioned by presentations. In apprehending things as rough or smooth, hard or soft, we must have special touch-sensations; in apprehending them as red or green we must have correspondingly special colour-sensations; in apprehending them as sweet or salt we must have appropriate taste-sensations. In general, the mind is dependent on immediate experiences for the cues which at any moment determine the direction of thought to objects which are not immediate experiences. It is the function of presentations to present objects which are not themselves presentations.

Retentiveness, association, and reproduction seem, in general, to involve the same principle. It is only because presentations leave behind them traces or dispositions that the connected objects are capable of being retained or revived. This seems plain in simple cases. In ideally recalling the colour of an orange, I am very likely to do so by means of a mental image, which is a revival of actual sensations which I have experienced in seeing oranges. Here, the actual sensations have, in disappearing, left behind them a disposition which makes possible the mental image, and this, again, gives a cue to the thought of yellow as a quality of an external object.

But it is also possible for persons who are not habitual visualisers to understand the meaning of the word yellow, without having any definite sensory image resembling the

sensation which they have in seeing something yellow. The only definite image in their mind may be that of the word itself. Are we then to say that the word suggests a pure thought which does not in any way depend on sensuous experience? We cannot assert this unless we are also prepared to say that yellow would have been thought of in the same way if there had been no previous sensations of yellow, or if these had vanished, like reflections flitting across the face of a mirror, without leaving any trace behind. This seems impossible. The natural hypothesis is that the dispositions generated in previous sense-experience do endure and operate, although they do not give rise to a distinguishable image or mental picture. Without giving rise to a distinguishable image they may modify in a vague and elusive way our total immediate experience of the moment, and I have no doubt that they do so. But, whether this is so or not, they at any rate operate as factors, determining our awareness of what is meant by the word "yellow."

Consider next the way in which we apprehend meanings more complex and remote from actual sense-perception, such as that of the word "wealth." On hearing or seeing this word, we at once apprehend its distinctive meaning. Yet there need be no sensuous image in the mind except that of the word itself. If there is an image it is bound to be totally inadequate of itself to determine what we mean. We are likely to have some such mental picture as that of a bale of goods lying on a wharf. But this does not enable us to picture what we mean by wealth, but at the most only one small item connected with this very complex concept. A child who has not yet formed the concept so as to be able to understand the word may picture a bale of goods on a wharf just as vividly and distinctly as we do; and the same image might serve

equally well for different concepts—for that of a cargo, or a bale, or a seaport, as well as for that of wealth.

Are we, then, to conclude that our apprehension of the meaning of the word wealth is, in the main, an act of pure intellect without any adequate cue, direct or indirect, in presentational experience? We shall see that this is an unfounded supposition, by considering the way in which the word has originally acquired its meaning for us. In part, we have come to annex this meaning to it, because we have heard it in combination with other words and have had to find a sense for it suitable to its context. But this only pushes the question further back. In the long run, words have acquired their meaning through their application in connexion with objects directly perceived through actual presentations. The word "wealth," for instance, has been applied to piles of goods, to rich corn-fields, to abundance of flocks and herds, etc. If the corresponding presentations had not generated mental dispositions and if these dispositions had not been associated with each other and organised in a complex system we should not be able to apprehend what is meant by the word "wealth." When this word is heard, it throws the pre-formed dispositions as a whole into a state of nascent excitement which is the essential condition of our understanding what the word means in the absence of adequate imagery. If the word be "health" instead of "wealth," a different complex disposition is incipiently stirred by it, determining the direction of thought to a correspondingly different object.

It is not, perhaps, so clear that the nascent excitement of complex dispositions is accompanied by modifications of immediate experience. Here introspection is difficult because the experiences to be observed are, from the nature of the case, vague and elusive. In the attempt to examine

them they tend to resolve themselves into series of mental images. None the less, it seems safe to assert that in understanding the word "wealth" we not only have the intellectual apprehension of a certain object, but feel in a peculiar and distinctive way, and that in understanding the word "health" our immediate experience is, so to speak, coloured in a different way.

This is most evident where there is an abrupt transition between disconnected systems of dispositions. Puns supply good examples; we may illustrate by one quoted by Lamb from Swift. "An Oxford scholar meeting a porter who was carrying a hare through the street, accosts him with the extraordinary question: 'Prithee, friend, is that thy own hair or a wig?'" Lamb speaks of the "despondent looks of the puzzled porter." What, we may ask, took place in the porter's mind? Was it merely an oscillation and conflict between one meaning of the same sound and another? Was it not also an oscillation and conflict between two conspicuously different modes of immediate experience, comparable to that which takes place when we pass from a lighted room into a dark one or step from the dry pavement into a puddle? As another example, we may take the change which takes place in our experience as a whole when we see what is apparently a book on a shelf, with an interesting title, and on examining it more closely find that it is a dummy. The reason why these vaguely experienced presentational differences are, in general, not so easily recognisable is that they emerge by insensible gradations. For instance, in reading a book, our total experience at any given stage is mainly determined by our initial view of the subject-matter and by what we have already acquired in reading what precedes. As we read on, each successive word or sentence, taken singly, contributes but little to the total impression;

hence the difference which it makes is not separately appreciable.

What is the relation of the vague presentational experiences which we are now considering with the theory of sub-conscious sensations? It has been maintained that there is here no essential difference. The only difference, in this view, is that in the one case we experience sensations which we fail to discern and that in the other we experience images which we fail to discern. When, for instance, I hear and understand the word wealth, there are really in my mind separate sub-conscious revivals of the special sensuous experiences through which I have learned to apprehend the meaning of the word.

This position, however, seems untenable. It ignores a vital distinction. When I notice sensations of sound, or sight, or touch, which had previously been experienced without being noticed, I am usually aware that they were there before, without being noticed. But when I turn my attention to what I mean by the word wealth, so as to resolve it into its constituent details, I get a different result. It is true that if I push my scrutiny far enough, I come upon groups and series of mental images; but it is not true that I recognise them as having pre-existed before they were noticed. On the contrary, I seem to be clearly aware that they were not there before, and that they emerge for the first time when I distinguish them. To take a simpler case; when we are trying to recollect definite details, such as a man's name, "what we are trying to recollect seems to waver, now at the tip of the tongue and the next moment completely gone, then perhaps a moment after rising into clear consciousness. Sometimes when asked, say for the name of a college contemporary, we reply: 'I cannot tell, but I should know the name if I heard it.' We are aware that we could recognise though

we cannot 'reproduce.'"[1] In such instances, our previous experience of the name does contribute to modify in a peculiar way our present experience. But it seems equally clear that no image of the name arises until the attempt to remember it succeeds.

In general, it is not merely or mainly through images, either distinct or sub-conscious, that the excitement of a complex disposition tells on our conscious life, and conditions the thought of objects which are not directly experienced. It operates also by giving rise to indefinite and not further describable experiences which may be called imageless presentations.

Sometimes such amorphous presentations are the only presentations in the mind relevant to the theme we are attending to. It is true that, in general, the onward movement of thought involves a train of successive images, —images of words if there are no other. But the images do not follow each other quite continuously. There are gaps between them. Though such intervals are empty of imagery, they are by no means absolutely empty. They are filled by immediate experiences which have a quite specific character, although they are vague and indistinct. When, in writing, I have to consider what I am going to say next, my mind may be intensely active and I may have a quite peculiar feeling corresponding to the special nature of the topic with which I am dealing; and yet I may not have a single definite image. The mind may be stirred to its depths without anything floating to the surface. It is a grave defect of the earlier psychologists, and especially of English psychologists, that they failed to recognise the importance of such vague states in our mental life. No one has done so much as Professor James toward correct-

[1] Ward, *op. cit.*, p. 560.

ing this error. The real state of the case is well summed up in the following quotation from his *Principles of Psychology*. "The definite images of traditional psychology form but the very smallest part of our minds as they actually live. The traditional psychology talks like one who should say a river consists of nothing but pailsful, spoonsful, quartpotsful, barrelsful, and other moulded forms of water. Even were the pails and the pots all actually standing in the stream, still between them the free water would continue to flow. . . . Every definite image in the mind is steeped and dyed in the free water that flows around it. With it goes the sense of its relations near and remote, the dying echo of whence it came to us, the dawning sense of whither it is to lead. The significance, the value, of the image, is all in this halo or penumbra that surrounds and escorts it—or rather that is fused into one with it and has become bone of its bone and flesh of its flesh."[1]

§ 3. **Retentiveness and Continuity of Interest.**—The dispositions which play an important part in mental development are mainly, if not exclusively, formed within the sphere of attentive consciousness, and not within the field of sub-consciousness. In this respect, both continued attention to the same total object and diversions of attention from one object to another must be taken into account as conditions of retention, association, and reproduction. But continued attention to the same total object has a peculiar significance, inasmuch as it generates what may be called a *cumulative* disposition, a disposition which is the resultant effect of the entire process as a whole. Further, the possibility of continued attention itself originally depends on the progressive formation of such a disposition to which each stage in the development of

[1] *Principles*, vol. i., p. 255.

the total object contributes. All progress towards an end depends on the persistence of the results of previous process as the basis of succeeding change. So in this case, continuity of interest is only possible if and so far as each succeeding stage of the attention-process is determined and qualified by the cumulative disposition left behind by preceding stages. At the same time this cumulative disposition is itself subject to modification by each new presentation as it emerges. Dr. Ward has given an example which partially illustrates this point.

"Suppose that in the course of a few minutes we take half a dozen glances at a strange and curious flower. We have not as many complex presentations which we might symbolise as F_1, F_2, F_3. But rather, at first, only the general outline is noted, next the disposition of petals, stamens, etc., then the attachment of the anthers, form of the ovary, and so on. . . . It is because the earlier apprehensions persist that the later are an advance upon them and an addition to them."[1]

This example excellently illustrates the working of retentiveness where there is continuity of interest. But it does so only partially and for a special case. The case adduced is one in which "earlier apprehensions" recur as separately discernible parts of the same simultaneous whole with the later. The process by which the "earlier apprehensions" were originally formed is not itself repeated, inasmuch as the preparatory dispositions left behind by previous experience render it unnecessary. Hence, there is room for further advance,—for growing distinction and definition within the total presentation. But with the new distinctions the old also are combined in the same complex whole. This is one of the ways in which pre-formed dis-

[1] Article on "Psychology," *Encycl. Brit.*, p. 557.

positions may operate. But it is by no means the only way. The persistent traces of past experience may modify present experience and be modified by it, without reappearance of the detailed content of the past experience in the actual moment of present consciousness.

The effect of rhythmic repetition of the same stimulus is peculiarly instructive, because the external occasion of each successive impression is throughout the same, so that modifications of consciousness arising in the course of the process must be due to the working of retentiveness,—to the cumulative disposition left behind by previous impressions. The sequence of physical stimuli is $a, a, a, \ldots$, the sequence of mental states is $a_1, a_2, a_3, \ldots$. The mere fact that a_2 comes before consciousness as a *repetition*, as *another* of the same kind, constitutes an important difference between it and a_1. But, besides this, there may be a gradual modification as the series advances, until a point is reached in which each new impression produces an effect relatively so small, in comparison with the accumulated result of previous impressions, as to be inappreciable.

This is well brought out in experiments on the "span of attention." The purpose of these experiments is to ascertain how many successive objects of a certain kind can be apprehended as a single group. It is found that, after hearing as many as eight successive sounds at regular intervals of, say, a quarter of a second, the subject is then able to distinguish this series as a whole from another equal or unequal to it. Counting is not admitted, and the successive sounds are of course not all simultaneously discriminated at the close of the series. This is evidently a cumulative effect.

Apart from special experiments in the laboratory, anyone can easily verify the statement that successive series

of a rhythmic character can at their close be apprehended as a whole without mentally reproducing and discriminating in the moment of apprehension the several sequent parts which compose them. Thus, in walking, we may mentally divide our successive steps into distinct groups, and be aware without counting when one series ends and another begins. We need not even know the number of steps which are grouped in this way within a single series. We may simply begin by walking a certain number of paces without counting them, and then as we proceed mark the points at which the initial series has repeated itself.

We have so far considered only the regular sequence of physically identical impressions. But the most important cases of rhythm are those in which recurrent similarity in certain respects is combined with diversity in other respects. The rhythm of verse, which depends on a more or less uniform recurrence of long and short or of accented and unaccented syllables, may serve as an illustration. In hearing a line from Milton or Vergil we need not at any moment have more than one word actually present to consciousness. Yet this single word appears as part of the whole and is qualified in a quite specific way by its place in the whole. The sound of the word "unpremeditated" has a quite different value for consciousness in the present sentence or in a dictionary from that which it acquires in Shelley's lines:

> "That from heaven, or near it,
> Pourest thy full heart
> In profuse strains of unpremeditated art."

Substitute "unstudied" for "unpremeditated," and the result is not merely one word in place of another. On the contrary, the occurrence of the wrong word is for consciousness the ruin of the whole rhythmic structure.

What is true of verse is still more obviously true in the case of music. The last note of a melody may be the only note of which we are aware at the moment it strikes the ear. Yet in it the entire melody is in a sense present. It comes before consciousness as part of a quite specific whole and derives a specific character from its place in that whole. The cumulative disposition generated by the ordered sequence of previous notes cooperates with the new stimulus to the organ of hearing, and the ensuing state of consciousness is the joint product of both factors mutually modifying each other. If a wrong note be struck, the whole melody is at once marred. The same happens if a note is unduly prolonged. Throughout the process the part is determined by the whole, and the whole by the part.

In reading a sentence or a paragraph, when we come to the final word, the meaning of the sentence or paragraph as a whole is present to our consciousness. But it is only as a cumulative effect of previous process. What is directly given as a special datum is the last word itself and its meaning. In a similar way, the cumulative effect of one paragraph or chapter of a book qualifies and determines the meaning of another. We may set by the side of this highly complex case a very simple one. Pronounce successively the words *fructify*, *mystify*, *identify*, *simplify*; all these words terminate in the same sound. When we are just finishing or have just finished the utterance of each word, the special item of sensation before consciousness is the final sound they have in common. The preceding sounds in which they differ have vanished from consciousness; nevertheless, in each case we are aware that we have said one word and not another, that we have said *fructify* and not *mystify*, and so on. This can only be because in each instance our consciousness, when the final sound is being

pronounced, is modified by the cumulative effect of the preceding sounds.

It is in connexion with active movement that cumulative dispositions are formed in the earliest stages of mental development. The child, for instance, has to learn how to grasp things with his hand under guidance supplied by sight. To begin with he does not do this at all, and he gradually acquires the power of doing it through a series of trials. In this process, the experiences due to active movement, to sight, and to touch, give rise to a total disposition, which, when it is fully organised, enables him to aim at and seize accurately what he sees within his reach. It is in such ways that sensations become integrated or synthesised in special groups or systems, which are apprehended in their unity as distinct from the general mass of sense-experiences which accompanies them.

The same holds good for the activities of the body and sense-organs by which the child learns to speak, to creep, to walk, etc., and to correlate the data of different senses in the perception of single things, so that one such datum comes to stand for the unity of the whole, as, for example, a patch of yellow colour comes to stand for an orange. The appearance of sugar is, initially, disconnected with its taste. It is through the act of grasping the visible sugar and putting it into the mouth, that a single complex percept is formed in which the sight of the sugar *means* its sweetness.

This cumulative effect of the preceding phases of a conative process on the succeeding may be called *primary* retentiveness, in order to distinguish it from the retentiveness which is involved in reproduction and association.

§ 4. **Primary Acquirement of Meaning.**—Primary retentiveness is correlated with what we may call primary

acquirement of meaning. We may sum up the result of the last section as follows: (1) In all attention having continuity of interest, and consisting of a series of distinct steps, a cumulative disposition is gradually formed which is the product of antecedent mental change, and a cooperative factor in succeeding mental change. (2) The after-effect of preceding mental process is not reproduced, but simply persists or is retained. (3) Its persistence in no way involves the persistence or the resuscitation of the specific items of sensation or mental imagery which have contributed to form it. These do not persist, but only their effects. If we denote the sequences of specific items of sense-experience, or, it may be, of ideal imagery, by a, b, c, d, then a, b, c, d, by no means adequately symbolises the process as a whole. For when b occurs, the resulting state of consciousness is the joint product of b and the persistent disposition or after-effect left behind by a. Similarly, when d occurs, the resulting state of consciousness is due to d in cooperation with the persistent disposition left behind by a, b, and c. We may denote the after-effect of a by m_1, the after-effect of a and b by m_2, and so on. The whole series may then be represented by a, bm_1, cm_2, dm_3.

Now what does m stand for? What change or modification of consciousness does it represent? Clearly, it represents the relation of the specific items b, c, d, to the whole of which they are part, a peculiar character which belongs to them in virtue of their being part of this whole. Now the only general word which is at all appropriate for expressing this kind of consciousness is the word *meaning* or *significance*; m, then, stands for meaning or significance. The meaning which is essentially involved in all continued attention to the same total object may be designated meaning as *primarily acquired*, to distinguish it from that which depends on association and reproduction.

It must be clearly understood that the reference here is only to such meanings as are acquired. It is not implied that *all* meaning is acquired. A certain visual sensation, by such processes as I have described, comes to mean an orange. But we need not assert that the visual sensation has no original meaning of its own, distinct from what may accrue to it through its connexion with other presentations. It may be that of itself, when it is apprehended with sufficient distinctness, it is inseparably connected with the thought, however vague and rudimentary, of an external object. The sensation of yellow carries with it the thought of something yellow. On the other hand, our apprehension of the yellow thing, as something rough to the touch, juicy, having a certain odour and taste, etc., is not part of the original meaning of the visual presentation. It has been acquired, and acquired in the first instance through primary retentiveness conditioned by the conative continuity of attention.

§ 5. **Association and Reproduction.**—On seeing a flower, I am told that it has a certain name. Afterwards, I hear this name again: it may then call up to my mind a mental picture of the flower, though no flower is actually present. It is clear that if I had never seen the flower, the mental picture of the flower would not have arisen. Now suppose the original perception of the flower had left no trace behind it after itself ceasing to exist,—that it had flitted over the surface of my mind like a shadow over the surface of a stream, without producing any permanent result. The case would then have been just the same as if I had never seen the flower. The mere hearing of the name would be inoperative unless there were something for it to act on,—an appropriate *trace* of past experience constituting a preparatory *disposition* for future experience.

But primary retentiveness is not in this case sufficient.

More is implied than the mere cumulative effect of the previous phases of a continuous process determining succeeding phases. Retentiveness in this instance works by way of reproduction and association. The specific nature of the original experience, which we call the perception of the flower, is partially reinstated in the mental image of the flower. The name, as we say, *reproduces* the mental image. It does this through association. The actual perception of the flower occurred as part of the same continuous conscious process as the hearing of the name. Hence, when the name occurs again, it may re-excite the mental disposition left behind by the perception, and re-excite it in such a way that the mental image of the flower rises before the mind although no actual flower is present to the senses.

In so far as the mere fact that a certain modification of consciousness has already occurred constitutes the general possibility of its recurrence, retentiveness takes the form of reproduction. The general possibility of recurrence is for the most part actualised in each special case by association. The disposition left behind by the previous experience must be re-excited if the experience itself is to be reproduced. The re-excitement is mostly, though not always, effected by a presentation similar to some presentation which has formed part of the same total process with the experience which is to be reproduced. This is expressed by saying that the re-instatement takes place by the previous association of the reproduced and reproducing presentation. In the example given, the association is between the perception of the flower and its name. Repetition of the name revives by association the image of the absent flower.

§ 6. **Reproduced Meaning.**—Reproduction has a great many modes and degrees, according as the original experi-

ence is more or less fully and independently reinstated. The least that can happen, in order to make the word *reproduction* applicable at all, is found in a process of fundamental importance which we may call the *revival of meaning*. We must distinguish between meaning as first acquired and meaning as revived. Primary acquirement of meaning accompanies the first occurrence of any series having continuity of interest. Secondary or revived meaning accompanies its recurrence, and depends on the fact that it has occurred before. In the series a, bm_1, cm_2, dm_3, on its first occurrence d has a meaning, m_3, due to the cumulative disposition left behind by a, b, c. Now, suppose that on a future occasion the process as a whole is repeated. Its point of departure is in a, but a now excites the cumulative disposition produced by the previous occurrence of the whole series a, bm_1, cm_2, dm_3. The starting-point of the series is therefore no longer a, but am_4. In other words, a reproduces by association an *acquired meaning*.

Let us consider the example of a tune. On first hearing it, the successive notes have each a significance,—a value for consciousness derived from their connexion with the whole. Now suppose that the tune has been repeated often enough to become recognisable. In order to recognise it, it is not necessary to go through the whole again. You know what the tune is as soon as you have heard a certain portion of it. This stands for or *means* the rest; and if you are only interested in recognising the tune, it is quite unnecessary to go further, or even mentally to reproduce what follows. So, if I begin to say, "Twice one is two, twice two"—there is no need for me to go further. A hearer who knows the multiplication table knows what follows as a whole without detailed repetition. The beginning of the series is equivalent to

the whole, and it is just because it *means* the whole that it is unnecessary to repeat the whole in detail.

Let us now take a case which belongs to quite a low level of conscious life. A chick on emerging from the shell, and without previous experience, tends to peck at, seize, and swallow all small objects.[1] This is a conative process, which has for its end the cessation of the appetite for food. Now the chicken does not, at first, distinguish between what is edible and what is not. This it has to learn by experience. It will at the outset peck at and seize all worms and caterpillars indiscriminately. There is a particular kind of caterpillar called the cinnabar caterpillar. When this is first presented to the chicken it is pecked at and seized like other similar objects. But as soon as it is fairly seized it is dropped in disgust. When next the chicken sees the caterpillar, it looks at it suspiciously and refrains from pecking. Now, what has happened in this case? The sight of the cinnabar caterpillar re-excites the total disposition left behind by the previous experience of pecking at it, seizing it, and ejecting it in disgust. Thus the effect of these experiences is revived. The sight of the cinnabar caterpillar revives its *acquired meaning.* It means the experiences which in the first instance followed it; and just because it means them it may more or less dispense with the necessity of actually repeating them. It may so determine the course of action that repetition or reinstatement of the specific items of the previous experience is needless. To this extent, it is practically equivalent to them: it works instead of them.

When one thing *means* another, it can, for certain purposes, or in reference to a certain end, be substituted for another. If *a* means *b*, this does not imply that *a* carries *b*

[1] This example is taken from Lloyd Morgan's *Habit and Instinct,* p. 41.

along with it or about with it. We might as well suppose that a five-pound note must always have five sovereigns literally wrapped up in it. The note will pass current instead of five sovereigns, and in like manner the peculiar visual appearance of the cinnabar caterpillar will, in some degree, pass current instead of the peculiar sensation of disgust which has previously followed it. It re-excites the whole disposition left behind by the previous process, and it re-excites this disposition as it has been modified in the course of previous process. Consequently, this process will not take place again as it took place before. But to understand the special kind of transformation which it undergoes, we must take into account the essential nature of appetitive process. This lies in its being directed to an end,—in the case of the chicken, the satisfaction of the appetite for food.

This tendency towards an end is manifested in one general character of all appetitive process. Lines of action, if and so far as they are unsuccessful, tend to be discontinued or varied; and those which prove successful, to be maintained. In this way, for instance, accuracy in the act of pecking is attained by the chicken. When it misses it tries again and again with slight variations until it succeeds, and it is the successful adjustments which tend to persist, and the unsuccessful which are eliminated. The endeavour towards an end, whether the end be definitely foreseen or not, is *ipso facto* an endeavour to avoid failure and obstruction. Everything in the way of check or impediment or want of success causes dissatisfaction and altered behaviour. This holds good of appetitive activity in its primary occurrence; it is always characterised by persistence with varied effort. The same must also hold good for its repetition. Here, too, the lines of action which proved unsuccessful on its primary occurrence will be suppressed

whenever the conditions under which they previously led to failure are recognisable. Thus, the sight of the peculiar markings of the cinnabar caterpillar will, at the outset, by its acquired meaning, repress the tendency to peck and swallow. In other words, so far as the end of action is concerned, the sight of the caterpillar is superior to the actual taste of it, just as cheques and paper money generally are for certain purposes superior to coin.

The process which we have called the revival of meaning is the minimum in the way of reproduction required to explain intelligent learning by experience. All more specific modes of reproduction pre-suppose it, and owe their guiding efficacy to it. All revival of specific items of sensation and the like, in so far as it makes possible intelligent adaptation to the result of previous experience, must make more definite and explicit the peculiar consciousness which arises from the re-excitement of the total disposition left behind by previous process.

The case we have analysed is sometimes explained in a different way. It is said that when the chick sees again the caterpillar, which it has previously ejected in disgust, the previous sensation of disgust is reproduced by the sight of the peculiar markings of the caterpillar. The primary experience of disgust prompted the ejection of the caterpillar; hence, it is argued, the revived sensation will lead the chicken to refuse the unsavoury morsel. Now, it is probable enough that something which may be called a revival of the disgusting sensation actually takes place; but this is not sufficient, and possibly not necessary, to account for the result. According to the proposed explanation, the chick has (1) a primary sense experience, the sight of the caterpillar, and (2) a faintly revived sensation of disgust. What must follow? Each of the two sensations, the one primary, and the other secondary, independently

prompt to a certain kind of action, and the result can only be a sort of mechanical interference, not intelligent guidance. The visual experience prompts to picking and seizing. The revived distaste prompts to the act of ejecting or dropping from the beak. The tendency to ejection ought to interfere with the act of pecking only in so far as the two movements are mechanically incompatible. One would expect a nondescript blend of the two movements, or an alternation between them. Intelligent behaviour cannot be a product of such conditions. Two motor impulses of a quasi-reflex character are brought together in a mechanical way, and nothing can ensue except a sort of mechanical resultant. It is true that if it be granted that the sight of the cinnabar caterpillar has, from the first, a specific meaning, this meaning may be rendered more explicit by re-instatement of the sensation of disgust. But the mere re-instatement of the sensation of disgust taken by itself does not account for the result, whereas the acquirement of meaning might account for the result apart from the revival of the specific sensation.

Revival of meaning is that mode of reproduction which approaches most nearly in its nature to primary retentiveness. It might indeed be deduced *à priori* from the existence of primary retentiveness. If the successive phases of a process concur to form a total disposition as their cumulative effect, the renewal of a part of the process must tend to re-excite this disposition. Just as in primary retentiveness it is not the specific items of previous experience which persist in succeeding experience, but only a modification of consciousness due to the cumulative disposition, so the re-excitement of the cumulative disposition does not necessarily involve revival of the specific items of previous experience, and it must involve something different from this. It must involve what primary retentive-

ness involves,—that peculiar modification of consciousness which we can only call *apprehension of meaning* or *significance*, the peculiar character which the part derives from its relation to the whole.

At this point we must pause a moment to settle a question relating to the use of a psychological term. Are we to call a reproduced meaning an *idea*? Certainly, when I see an orange and recognise it as such, it is natural to say that the visual presentation revives or recalls the idea of an orange. Similarly when the line "The curfew tolls the knell of parting day" brings at once before my mind the poem as a whole, it is natural to say that the words I read or hear call up the idea of Gray's *Elegy*. In both cases it is natural to say that what is directly given to the mind is ideally extended or supplemented through associations formed in my past experience.

It would be an awkward restriction to debar ourselves here from the use of such terms as idea, ideal revival, and ideal representation. But if we are to avoid confusing very different modes in which retentiveness and association work, we must make an important distinction. We must distinguish between free and explicit ideas, on the one hand, and tied and implicit ideas, on the other.

When the opening words of Gray's *Elegy* suggest to me the poem as a whole, I may or may not proceed to recall it in detail, as I should do if I mentally repeated it to myself. Such repetition would involve a series of verbal and other images, each conveying its own distinct meaning and so constituting a separate idea.

If I do not proceed to recall details in this manner, what I apprehend is merely the poem as a whole, without separate discernment of its parts. Such apprehension of the whole without separated discernment of its parts may be called a tied and implicit idea. It is implicit because it

involves details which are, as it were, wrapped up in it, which are not unfolded for consciousness; it is tied because it does not break loose from the sensations or images which suggest it, so as to have a distinct existence as a separate member of a train or procession of ideas capable of evolving itself when the original sensations or images have disappeared.

Similarly with the orange. Whatever in our apprehension of the object is not merely due to our immediate sensation in seeing it, is ideally supplied. How much is thus supplied is shown by cases of disappointed expectation, as when what is taken for an orange turns out to be only an imitation in wax, or when what is taken for a jug full of water turns out to be empty. Yet the ideal extension of the datum of actual sensation need not assume the form of separately distinguishable ideas. In looking at the orange, and recognising it as such, we need not have a mental picture of its pulpy contents or of the opposite side which is hidden from our sight, or of a separately revived sensory image of its sweet and acid taste. The ideal revival may be mainly implicit.

But even when revival is implicit, we can distinguish modes of reproduction more specific than what is involved in the recall of acquired meaning as dependent merely on the nascent re-excitement of a total disposition. There are intermediate stages between this and explicit ideas. Further, when ideas begin to be explicit they may none the less continue to be bound up with actually present sensation, so that they do not break loose from this as successive members of a train or series of free ideas, capable of proceeding by itself independently of actual sensation. Thus we have to consider (1) Complication or Pre-perception, (2) Ideas which are explicit but not fully free or detached from sense-impressions.

§ 7. **Complication.**—In complication, the ideal revival, though not separately discernible as an explicit idea, alters the character and adds to the complexity of actual sensation. "The sight of ice," says Dr. Ward, "yields a fore-feel of its coldness, the smell of baked meats a fore-taste of their savour."[1] What we have in such cases is rather a preperception than a mere forethought. The ice does not merely look cold, it has a cold look. The residua of past sensations of cold become complicated and entwined with our visual presentations so as to modify its character as a direct sense-experience. Yet we have not a separately distinguishable idea of the coldness of the ice with a separately distinguishable image as its vehicle, side by side with our visual perception. The revival and the original sensations coalesce into a single complex sensation.

We may take as a typical example of complication the peculiar differences of quality which attach to sounds according to the various modes in which they are produced. We distinguish clapping, crashing, clashing, hissing, bursting, splitting, rending, grinding, rushing, and whistling noises. Now these sounds doubtless have distinctive qualities, considered merely as auditory sensations. But it seems clear that they also have acquired modalities due to association. In producing them we have in each case certain distinctive experiences of movement and resistance, and in seeing them produced similar experiences are excited in a partial and inchoate way. When the sounds are merely heard their quality is partly constituted by a partial and modified reproduction of these sensations. The reproduced element is not usually distinguished without an express act of analytic attention. But it is none the less present as a peculiar modality of the auditory experience.

[1] *Op. cit.*, p. 572.

Perhaps this will be most clearly brought out by considering the imitative words by which the nature of such sounds is commonly expressed. The word "clap" resembles the sound of clapping, the word "hiss" the sound of hissing, and the word "tear" the sound of tearing. But on examination it soon appears that the resemblance by no means lies wholly in the sounds considered merely as ear-sensations. It depends also on the movements of articulation. In saying "clap," the lips are clapped together; in saying "hiss," the breath is driven through a narrowed aperture; in saying "tear," the tongue is pulled away from the palate. In these and similar instances we do not ordinarily distinguish between the motor and the purely auditory imitation. So in the original experiences which are imitated the two factors are combined without distinction, constituting a complex sensory quality which escapes analysis until the reflective scrutiny of the psychologist is brought to bear upon it. In this complex quality the sound as such is the dominant constituent, and the associated motor element appears as a modification of the sound.

For further illustration we may refer (1) to the qualification of sight by touch and resistance, and (2) to the qualification of touch and resistance by sight.

"The sight of a suit of polished armour," says Dr. Ward, "instantly reinstates and steadily maintains all that we retain of former sensations of its hardness and smoothness and coldness."[1] The armour *looks* hard, smooth, and cold. But this peculiar appearance to the eye does not necessarily involve any distinct representation or idea or separate sensation of hardness, smoothness, or coldness.

[1] Article "Psychology," *Encyclopaedia Britannica*, 9th edition, part xx., p. 57.

The corresponding tactile and other experiences are not reproduced as separate and distinct modes of consciousness. They are not discriminated from the visual experience itself. The reproduction manifests itself rather as a modification of the visual experience—an addition to its unanalysed complexity. Similarly, ice looks cold because we have felt it to be cold. If it had been always warm to the touch, it would have looked warm. Yet its cold look is not a suggested idea; nor is it a distinct temperature-sensation. It is something which is presented as if included in the visual appearance as an integral part of it. Any attempt to separate it destroys both its own specific character and that of the visual experience.

If (2) we now turn to the converse case, the qualification of actual touch experience by revived visual experience, we find the union of the constituents of the complex much looser. This does not mean that they are more easily separable; for the association in normal human experience is almost, if not quite, indissoluble. But when the tactual experience is primary, the reinstated visual experience is much more prominent, more readily distinguishable and separately appreciable, than is the reproduced tactual element when the visual experience is primary. We have here a case of complication which approaches most closely to free reproduction, and very frequently and easily passes into it. When we close our eyes and touch an object, we need not indeed have a distinct picture of the surface touched. But the slightest reflective scrutiny is enough to show that the total impression is complex, containing a visual as well as a tactual constituent, and also, in most cases, that the visual constituent is as prominent as the tactual or even more so.

§ 8. **Explicit Ideas which are not Free.**—There may be explicit ideas which merely extend and supplement present

sense-perception instead of breaking loose from it so as to form members of an independent train of ideas, which may go on after the perception has ceased or even apart from any sense-perception at all. A hunter seeing a tiger may call up a distinct mental picture of the tiger's coming leap; he has then an explicit idea; but this does not lead to a train of ideas relating to the nature and habits of tigers, or to his previous experiences in tiger hunting, or to relevant anecdotes which he has heard. On the contrary, it only seems to give him a fuller apprehension of the present situation and guide him in taking immediate measures to meet it. Again, when we are looking for a box of matches in the dark, in passing the hand over the side-board or in jogging the coal-scuttle with the foot, the large glossy shape of the one and the irregular blackness of the other may be distinctly pictured. But they do not usually give rise to independent trains of ideas. Instead, they yield us guidance in feeling about for the match-box. It is in this form that ideas first become explicit—as extensions of present perception, and as helping to prompt and guide the actions which directly depend on present perception.

§ 9. **Free trains of Ideas.**—In free reproduction, the reproduced presentation, *b*, is capable of existing apart from the *a* which reinstates it. *b* has an individuality of its own distinct from *a*, and it can follow *a* in time, so as to continue to exist when *a* has disappeared. In complication, on the other hand, and in ideas which are explicit but not free, the existence of *b* is bound up with the existence of *a*. "To realise this difference," says Dr. Ward, "we need only to observe first how the sight of a suit of polished armour, for example, instantly reinstates and steadily maintains all that we retain of former sensations of its hardness and smoothness and coldness, and

then to observe how this same sight gradually calls up ideas, now of tournaments, now of crusades, and so through all the changing imagery of romance."[1]

Often trains of ideas go on without any reference to surrounding objects; thus J. S. Mill composed a great part of his Logic while walking through the streets of London to and from his place of business. All detailed reminiscences of series of events as they followed each other in the past and all detailed anticipations of series of events as about to occur in the future are possible only through free trains of ideas. Under the same head comes all contemplation of *possible* alternatives, as such, and of their consequences; as when we say, "if *a* then *b*, and if *b* then *c*," etc. The like holds for all comparison of objects which have not been perceived in spatial and temporal connexion with each other, as when one compares the shape of a rock to that of a lion, or a valley in Cumberland with a valley in Devonshire.

The characteristics of ideas and their distinction from perceptions are topics which will be discussed at a later stage. Here we need only note that normally the sequence of ideas in a train is conditioned by a sequence of mental images of some sort, *e.g.* pictures seen in the mind's eye. The images, however, may consist wholly in revivals of words or of some kind of symbols, such as those of mathematics.

§ 10. **Motor Association.**—Owing to the intimate correlation of mental and nervous process, the mental life is from the outset constantly connected with impulses passing from the central part of the nervous system to the rest of the body and so giving rise to changes in the internal organs and in particular to muscular contrac-

[1] *Ibid.*

tions resulting in movements or tendencies to movement. In part, the special movements connected with special experiences are due to the inherited constitution of the nervous system, *e.g.* in reflex actions and also in that class of motor activities which are called instinctive.[1] But such connexions are also constantly being acquired through what we may call motor association.

Associations of this kind are initially formed under the control of interest and selective attention. A painful sensation, for example, is, apart from preformed associations, accompanied by diffusive and irregular movements; but if, among these, there is one which leads to relief from pain, this tends to arrest attention and to be repeated whenever a more or less similar situation arises, whereas other modes of behaviour leading to unsatisfactory results tend to be suppressed. It is not necessary that the painful experience itself should be renewed in order to bring into play the motor association; the recurrence of some other conspicuous feature of the total situation may be sufficient. Birds which have no previous acquaintance with human beings are not disturbed by the mere sight of a man with a gun. They are alarmed and take to flight only when he actually fires among them. But, in time, they become shy and take to flight whenever they see a man approaching them. In this way preventive movements become associated with the perception of certain objects. "Thanks to the orderliness of things, dangers have their premonitions." "The occurrence of some signal sensation" has acquired a meaning, and, when this acquired meaning is reproduced, an appropriate movement "occurs in time to avert the impending ill."[2]

The same holds good for pleasure as well as pain.

[1] See below, Bk. III., Ch. I.

[2] Ward, *op. cit.*, p. 588.

Whatever modes of behaviour are found to yield, maintain and enhance a satisfactory experience are stamped in by association so as to recur whenever occasion for them arises. Here, too, there is anticipatory adjustment of conduct due to acquired meaning. "Provided the cravings of appetite are felt, any signs of the presence of pleasurable objects prompt to movements for their enjoyment or appropriation."[1]

Motor associations can be effective in giving rise to corresponding movements and their consequences, only on condition that appropriate objects are actually present to sense-perception. In trains of free ideas what is recalled is rather ideal representations of movement, subserving the formation of plans of behaviour adjusted in advance to future or merely possible circumstances. But where the subject is dealing with an actually present situation, motor association may directly determine the course of action definitely adapted to it, without a previous train of free ideas. Thus when a hungry and thirsty man sees meat and drink before him, there is no need for him to set before his mind a series of ideas of the successive steps of his coming behaviour. On the contrary, he is likely to proceed at once to appropriate action, without previous ideal rehearsal of what he is going to do. The acquired meaning of his sensations is directly developed in detail by means of motor activity and the experiences which accompany and follow it.

When a motor association has become fixed in relation to frequently and uniformly recurring conditions, it may operate independently of attentive consciousness. This happens, for instance, when we thread our way through a crowded street while our attention is otherwise occupied.

[1] *Ibid.*

A striking example is supplied by the story of the disaster which befel a waiter who had been a soldier. While he was carrying a huge pile of plates some mischievous person called out "Attention!" Immediately the waiter's hand went to his sides and the plates crashed on the floor.

But the working of motor association is by no means confined to automatic habits. When we see a lighted candle the movements required for blowing it out are connected by association with the sight of it; but the association does not take effect unless we want to blow it out—unless we attend to it as a light that is to be extinguished. Similarly, when a traveller suddenly finds himself on the verge of a precipice and steps backward, his movement is determined by motor association, but it is prompted by a conscious appreciation of the meaning of the situation.

In general there are four points to be noted as characteristic of processes of this kind: (1) They supply a means of getting over again series of experiences like those which have occurred in the past under similar conditions; (2) this depends on preformed associations; but (3) the associations do not operate by directly reviving the experiences themselves, but circuitously by renewing the bodily movements on which they depend; and (4), so far as previous experiences are reinstated in this manner, they are not ideally recalled, but occur as actual sensations.

This mode of reinstatement through motor activity guided by motor association is more primitive than trains of free ideas. It is found in children and animals at a stage of mental development in which free ideas are absent or exist only in a rudimentary form. Its occurrence independently of free ideas constitutes a distinctive characteristic of perceptual process. The mental

lives of young children and animals are mainly on the perceptual level. Trains of ideas belong to a later development.

Sensations connected with the varying states of the internal organs of the body are reinstated in a way essentially similar. But in the case of these organic sensations, as they are called, we have to take account of all the outgoing nervous impulses which control vital processes in general, as well as those which proceed to muscles; we have also especially to consider the muscles concerned with such functions as breathing and the circulation of the blood, as well as those on which external movements of the body and its parts depend.

Change in the state of the internal organs is, in a very important measure, determined from within the body by changing conditions of the nervous system. Any strong nervous disturbance tends to discharge itself over the whole organism, affecting respiration, heartbeat, tension of the muscles, circulation of the blood, secretion, etc. Such a nervous disturbance may, in the first instance, be set up by an external impression such as a wound or a blow. But it may be afterwards more or less renewed by association without the external impression, and it may then centrally generate organic sensations bearing a marked similarity to those which accompanied its original occurrence. The physiological stimulus is indirectly reinstated, and it directly produces the sensation. Tickling is not merely a skin-sensation. The skin-sensation sets up changes in the central nervous system which determine diffused organic disturbance, including spasmodic movements, and the resulting organic sensation constitutes what is most specific in the experience of being tickled. But a similar effect may be induced without actual contact. By merely making believe to tickle a sensitive person it is

possible to produce the nervous disturbance with the resulting organic sensations and convulsive movements. In like manner, the mere sight of nauseous food may produce nausea and even vomiting. The intense organic discomfort which may be occasioned by merely looking on at a surgical operation, or even by seeing surgical instruments, has the same origin.

§ 11. **Facilitation and Arrest.**—In actual reproduction, one presentation reinstates another. But instead of actual reinstatement, we may have mere *facilitation*. The one presentation may favour the entrance of the other into consciousness without actually introducing it into consciousness.

Facilitation may assume many forms and take place under many diverse conditions. It is an essential characteristic of attention. The nurse whose attention is concentrated on the sick child is pre-disposed to notice whatever sign or movement it makes, and to take action accordingly. Her mind is set in a general attitude of response to whatever impressions come to her from this source. This general attitude of response to a certain kind of stimulus may persist even when conscious attention has itself ceased. The nurse who goes to sleep with her attention concentrated on the child is likely to be awakened by the slightest cry from it, though more intense sounds fail to disturb her repose.

Under the head of facilitation due to attention we may bring a fact noticed by Mr. Verdon in a very interesting paper on "Forgetfulness."[1] "Individuals often remember clearly and well up to the time when they have to use their knowledge, and then, when it is no longer required, there follows a rapid and extensive decay of the traces.

[1] *Mind*, O.S. ii., 449.

Many schoolboys forget their lessons after they have said them; many barristers forget details got up for a particular case. Thus, a boy learns thirty lines of Homer, says them perfectly, and then forgets them so that he could not say five consecutive lines the next morning, and a barrister may be one week learned in the mysteries of making cog-wheels, but in the next he may be well acquainted with the anatomy of the ribs instead." In other words, the general direction of interest facilitates the recall of certain experiences. It makes the corresponding dispositions more readily excitable. This seems only partially to depend on direct attention to the special subject-matter to be remembered. The barrister who keeps in mind for a week "the mysteries of making cog-wheels" does so through general interest in the case which he has in hand, and not by constantly thinking of cog-wheels. In other words, the corresponding mental dispositions are maintained in an excitable condition, not so much by attending directly to the subject-matter, as by attending to something connected with it. So long as the need for remembering remains, there is a sense of having something on the mind. When the need no longer exists, a feeling of relief is experienced, and the power of remembering disappears.

The nature of facilitation is well illustrated in a series of experiments carried out by Professor Pillsbury. Printed words variously mis-spelt were successively exposed on a screen for a period of about one-fifth of a second. The subject of the experiment was called on to read off these words. He did so for the most part incorrectly, and most often without noticing the wrong spelling. We have here nothing to do with the nature and frequency of the mistakes. What does interest us is the effect produced by calling out a word having some association with

the word to be shown immediately before the exposure was made. The result of this was always a great increase in the number of mis-spellings overlooked. "In only a very few cases did the word called out suggest the word to be shown before the latter was seen, and then the misprints were observed quite as frequently as at other times. In most cases, the relation between the two words was noted after the printed word was seen. In such cases, the association helped the entrance of the word. It seemed to confirm the results of the visual impression, and to give a feeling of confidence that the word seen was the word intended."[1] The words called, though they did not of themselves actually reproduce other words, yet facilitated the perception of one word rather than of another.

Arrest may be regarded as the negative side of facilitation. Whatever facilitates the occurrence of certain mental processes is a bar to the occurrence of others. The nurse, with attention concentrated on the child, is apt to overlook impressions which are not connected with the main direction of her interest. In general, any mental process tends to hinder the occurrence of others, if and so far as it does not facilitate their occurrence.

§ 12. **Habit and Automatism.**—Actions at first requiring attention come to be performed without attention when they are frequently repeated under sufficiently similar conditions. In such instances, the action is said to be *automatic*, to go on of itself.

"The clearest examples of habitual action taking place apart from attention are those in which attention is otherwise occupied, as when a person knits, or plays on a musical instrument, and at the same time engages in conversation, or threads his way through a crowded street

[1] "A Study in Apperception," *American Journal of Psychology*, viii. 3.

while absorbed in thought. It should be noted that in such instances the diversion of attention is probably never absolutely complete. The musician, for instance, is more or less aware that he is playing a piece of music, and the absent-minded walker is not utterly oblivious of the fact that he is in a crowded street and in motion. What can be asserted confidently is that in such cases there is no persistent and discriminating attention to the details of the action.

"This distinction helps us to understand another group of habitual actions which do not appear to fall into the state of secondary automatism, however much they may be practised. Fencing supplies a good instance in point. The most expert fencer cannot afford to allow himself to be absorbed in an irrelevant train of thought while he is engaged in a duel. On the contrary, the keenest watchfulness is required. The reason is that only certain component parts of the action have become thoroughly habitual; these do not of themselves require to be attended to. The practised fencer has not to think about the proper modes of thrusting and parrying; what requires attention is the tactics of his opponent. As soon as he discerns by sight or feeling the direction in which his antagonist's rapier is moving, the proper reply is made automatically. Thus, attention is demanded for the proper combination of a series of movements which are severally automatic, a combination which has to be adjusted to constantly fluctuating conditions. The union of attentive adaptation to relatively novel circumstances with automatic adaptation to circumstances more uniformly repeated is found in all ordinary voluntary action. Thus, the decision to blow out a candle may require attention, but the process of walking towards it and blowing is automatic." [1]

[1] Stout, *Analytic Psychology*, vol. i., pp. 260-261.

Habit is not confined to bodily actions. There are also habits of thought and of will. Of course, thought and volition are in their very nature processes that involve attention. When we speak of a "habit of thought" or a "habit of will," we do not mean that the special acts of volition or the special trains of thought can go on without attention. We have seen that in such bodily activities as fencing, "automatic processes may enter as component parts into a total process which as a whole is very far from being automatic. The inverse of this is seen in habits of thinking and willing. Here a comprehensive habitual tendency realises itself on special occasions by means of special processes which are not habitual."[1] We may take as an example the habit of answering letters on the day on which they are received. Here, what is habitual and automatic is not the actual process of writing the reply—this, of course, requires attention—but the writing of the reply on the same day on which the letter is received is a habitual and automatic procedure. It takes place as a matter of course. The alternative of postponing it to another day is not entertained without exceptional motives. A good instance of a habit of thought is that of the making of puns. There are some persons who continually make puns simply because they have fallen into the habit of doing so. Of course each single pun requires attention; but the general trend of attention in this direction rather than in other directions is a matter of habit.

The formation of habit involves the operation of two distinct conditions. The first is retentiveness; the second lies in the essential nature of conation, according to which conative processes cease, if and so far as their end is attained. Let us take as an example the child learning to

[1] *Ibid.*, p. 262.

walk. This at the outset involves full attention. "At the outset, performance falls far short of intention: only a certain series of contractions of certain muscles, in proper proportions and in a proper order, is capable of realising the end aimed at, with the maximum of rapidity and certainty, and the minimum of obstruction and failure, and corresponding effort. At the outset of the process of acquisition, muscles are contracted which are superfluous, and which therefore operate as disturbing conditions. Others are not contracted at the right moment, and in the right measure, so that action is deranged. Now the effort to attain the end is, *eo ipso*, an effort to avoid failure and obstruction; hence there will be a constant tendency to alter muscular adjustments in so far as they are unsuccessful. Hence arise gradual approximations to success, and it is these which are permanently retained, while all that belongs to the process of trial, as such, disappears. In this way a fixed and uniform series of movements is organised, which can go on of itself without conscious effort—without trial and failure."[1]

It will be seen that the formation of habit is an example of facilitation. The dispositions left behind by previous conation facilitate subsequent conation in the attainment of its end. When this process of facilitation reaches a point at which conscious endeavour is no longer necessary, the action becomes automatic.

[1] *Ibid.*, pp. 267-268.

BOOK II.

SENSATION.

CHAPTER I.

General Characteristics of Sensation.

§ 1. **General Nature and Origin of Sensation.**—Sensations or impressions are for Psychology primary data: they are not themselves capable of being psychologically explained. There are no prior mental conditions on which sensations depend as mental images depend on sensations. We may say that the mind has a faculty or capacity for impressional experiences of a certain kind. But this is, of course, no explanation. When we inquire how the capacity or faculty is realised we find ourselves compelled to refer to physical and physiological, not to psychological conditions. The most immediate conditions of sensation consist in processes occurring in our brain; these are set going by antecedent events taking place in certain organs situated either at the surface or in the interior of our body, which in their turn are initiated either by other processes within the body, as in the case of such organic sensations as hunger and thirst, or by occurrences in the environment of the body affecting the external organs of sense, such as the eye, ear, or skin.

The nature of the resulting sensations has already been discussed. We have to remember, in the first place, that a sensation is not merely something mentally referred to or thought of, but also something immediately experienced. It exists only as an apparition in consciousness; when it ceases actually to be sensed it ceases *eo ipso* actually to exist. Sensations not only exist *for* the mind as objects of thought: they also exist *in* the mind. Closely connected with this is a second point, the privacy of sense experience. Each individual experiences only his own sensations, not those of others.

But though sensations are immediate experiences, existing only as contents of individual consciousness, they are also primarily objects attended to, distinguished, compared, liked and disliked. They are objective experiences or *presentations*. They are not, however, by themselves complete or independent objects. So far as we can discover, it is an essential condition of apprehending them as objects at all that something else which is not immediately experienced should be apprehended in connexion with them. All recognition of a sensation as of a certain kind and all apprehension of it as continuing to be of the same nature or as changing in nature at different moments, involves this reference beyond immediate experience. For at any one moment there is no immediate experience except the immediate experience of that moment. Its identity of nature or difference in nature in relation to past or possible future experiences can only be an object of *thought* transcending the immediacy of sense.

There is also another way in which sensations seem always to be inseparably connected with thoughts which transcend their own immediate existence. They seem always to put the thinking mind, as such, in communication with what we call external objects. They mean

something beyond themselves which conditions their existence. A sensation of red, for instance, means something red or something which appears red. In apprehending any sensuous presentation we apprehend it as conditioned by something which is not itself an immediate experience, something capable of existing before and after the sensation itself.

Thus, in general, we may say that the term *presentation* has a two-fold implication. It implies that the presentation itself is an immediately experienced object; it implies also that this objective experience specifies and determines the direction of thought to what is not immediately experienced. The presentation has a presentative function in virtue of which it presents objects which are not themselves presentations.

To a very large extent the meaning thus conveyed by sensations is acquired through retentiveness and association. But it would seem that it cannot be entirely acquired in this way. Derivative meaning ultimately presupposes original meaning which cannot be accounted for by retentiveness and association.

It thus appears that we can never have absolutely pure sensation, sensation absolutely devoid of meaning either original or acquired. We may even go further than this and lay it down as a general principle that sensations always have *derivative* meaning; for retentiveness and association operate from the very beginning of mental life. It may be urged that this cannot be the case in the earliest moment of experience. But even if we set aside what may perhaps be due to the results of ancestral experience transmitted by heredity, we have to recognise that the first instant of conscious life is only an ideal limit, which we cannot definitely mark off so as to consider it separately. Thus, even from this point of view, the con-

cept of absolutely pure sensation is an artificial abstraction. No actual sensation with which we can definitely deal is absolutely dissociated from past experiences.

§ 2. **Stimulus and Sensation.**—Sensations arise, in the first instance, only when a sense-organ is stimulated so as to give rise to nervous impulses propagated to the brain. A sense-organ essentially consists in a specially differentiated group of cells, so constituted that they respond by special processes when they are excited to action by appropriate occurrences in the external world or within the body itself. Normally such organs do not respond to other modes of stimulation than those for which they are specially attuned. Thus, in the eye there is a special apparatus which is normally excited by light-vibrations, and does not usually or readily react to other external agencies. Similarly, in the ear there is a special organ ordinarily responsive to sound-vibrations and not to other stimuli. The stimulus for which each sense-organ is peculiarly adapted is called its "adequate stimulus."

But the stimulus for which it is specially fitted is frequently not the only one which is capable of affecting it. When it responds to other agencies than those appropriate to it, it is said to be excited by an "inadequate stimulus." Where this is the case, the general character of the resulting sense-experience depends not on the nature of the stimulus, but on the sense-organ which is stimulated and its central connexions in the nervous system. However the organ of vision may be stimulated, if any sensation follows, it is always one of light or colour. A blow on the eye makes us see sparks. A sensation of light may even be elicited by stimulating the optic nerve after the eye has been excised. Sensations of sound result from mechanical or electrical excitement of the organ of hearing. To some extent the same principle holds good

for special varieties of sensations belonging to the same sense; for instance, the various qualities of colour or of sound. This is a point to which we shall have to recur in dealing separately with each of the special senses.

§ 3. **The Intrinsic Characters of Sensation.**—A sensation is said to be simple when it is not composed of parts which are themselves sensations capable of being separately experienced. Purple, for instance, is in this sense simple in colour-quality. It is true, indeed, that, when we compare it with pure blue and pure red, we recognise that it resembles both. Hence, we naturally say that it has both blue and red in it. But the blue and red do not exist in it as distinct sensations, each capable of being experienced by itself when the other is withdrawn. They have not the separate existence which belongs to both of them when a patch of red is set beside a patch of blue.

As this example shows, even when a sensation is simple it may still be possible to distinguish within it different aspects or inseparable characters, though it is not possible to distinguish within it different component sensations capable of existing by themselves. Purple is reddish and bluish although it does not contain a separate sensation of red and a separate sensation of blue. Now there are certain inseparable characters which can be distinguished in this way in all sensation. In all sense-presentations we can discern Quality, Intensity, and Protensity or Duration. The distinction and the inseparable unity of these common characters of all sense-experience will be best explained by an example. When we hear a sound of a certain pitch, its pitch constitutes its quality. But a sound of the same pitch may vary in loudness; this is a difference in intensity; the same quality is experienced more or less intensely—in a stronger or weaker form.

Again, the sound, as an immediate experience, has a different character according as it lasts a longer or shorter time. The sound which lasts a second feels differently when it ceases from the sound which lasts thirty seconds. This is a difference in protensity or duration.

These three aspects seem essential to all sensations, however simple they may be in other respects. If any one of them vanishes the sensation vanishes. A sound having neither the quality of a tone nor of a noise could have no existence. Similarly, a sound with no loudness and no duration could not be experienced at all. Of the three, quality may be regarded as the most fundamental; for intensity is the intensity of the quality and duration is duration of the quality and intensity. A more or less intense or prolonged sensation of sweetness is a more or less intense prolonged experience of the quality sweetness.

It is to be noted that though we are aware of all three characters in being aware of any sensation, we need not, and, very commonly, we do not distinguish them from each other. They are then apprehended implicitly rather than explicitly. "Implicit" means "wrapped up" and "explicit" means "disentangled." In being aware of the sensation as a whole, we are necessarily aware of its essential aspects, inasmuch as these are wrapped up in it. But we need not therefore disentangle them so as to discern them separately in distinction from each other and from the whole. This takes place, in the first instance, only through *comparison* of sensations alike in one aspect but differing in another, as when we compare two sounds of the same pitch but differing in loudness, or two sounds equally loud but differing in pitch. We are then led to distinguish the respect in which the sounds differ from the respect in which they are alike, and this distinction coincides with that between quality and intensity.

When two classes of sensation so differ in quality that they cannot be regarded as species of a common genus, the difference may be called one of kind, or, to use a term which has been recently introduced in this sense, one of Modality. Sounds and colours are distinct kinds or modalities of sensation. They are not only different but disparate or incomparable. Though both are recognisable as sensations, yet there is no common class of sensations to which both belong as sub-classes. On the other hand, blue and green or salt and sweet, do not differ in kind; for both blue and green are colours and both salt and sweet are tastes. When sensations do not differ in kind, it is often possible to find intermediate transitions leading gradually from the one to the other. Pure blue and pure green are connected in this way by an intervening series of bluish-greens and greenish-blues. Obviously there is no such gradual transition between sounds and colours, or between tastes and sounds.

§ 4. **Extensity.**—There is another inseparable character belonging to many kinds of sensation, though, probably, not to all, which may be called Extensity or extensiveness or diffusion or "spreadoutness." If you plunge one finger only into hot water and then immerse the arm up to the elbow, the resulting experiences differ otherwise than merely in intensity or quality. They differ also inasmuch as the second is more diffuse or extensive than the first. There is a similar difference between the sensations which arise when a few hairs of the head are pulled and when a large handful is pulled. Again, when a thing is first seen as a speck in the distance and then its appearance gradually grows bigger as it is approached, the change is a change in the extensity of the visual sensation.

Two peculiarities mark this experience of extensity. In the first place, it involves a diversity of simultaneous

sensations other than what is ordinarily recognised as their qualitative difference, and in no way depending on intensive difference. Contact with the bridge of the nose is distinguishable from contact with the tip of the nose independently of any differences in the nature of the touch-sensations as such. The touch-sensations may be due to exactly the same kind of stimulus and they may be very similar as regards roughness, smoothness, intensity of pressure, etc. Our power to distinguish them is not due to differences in this respect; it is rather conditioned by the local diversity of the areas of the skin on which the stimulus acts.

But even this is not the ultimate condition. The ultimate condition, it would seem, is central. It depends on the central termination in the brain of the sensory impulses from the skin. Evidence for this is supplied by surgical operations in which a flap of skin is drawn down from the forehead so as to become the skin of the nose instead of the forehead. It is then found that so long as the displaced skin retains its original nervous connexions, sensations due to it are localised in the forehead and not in the nose. The patient may appear to himself to have a frontal headache when it is really his nose which is affected. Cases in which a limb has been amputated teach the same lesson. Sensations due to irritation of the skin of the stump are referred by the patient to a limb which is no longer there, *e.g.* to an imaginary foot and toes. The sensations differ greatly in quality from those which he was in the habit of receiving from stimuli affecting the amputated limb. But the afferent nervous impulses run the same course to the cerebral cortex and consequently have the same *local sign*. "Local sign" is the term chosen to express this diversity of simultaneous sensations which does not depend on any assignable

difference in quality or intensity but is conditioned only by the diverse connexions of locally distinct parts of the sensory surface with the central nervous system.

Visual as well as tactual sensations have well marked local signature. We can distinguish a patch of white on the left margin of the field of view from an otherwise similar patch of white on the right margin. The two light-stimuli affecting separate parts of the retina do not combine to produce a single sensation of greater intensity than either would occasion by itself, as would happen, for instance, in the case of two simultaneous sounds of the same quality. On the contrary, they produce two sensations distinguished by diversity of local sign.

Extensity, then, involves a certain unique and ultimate diversity between simultaneous presentations, which is independent of their similarity in quality and intensity. But this is not all that is required to constitute an extensive experience. The presentations differing in local sign must also be united in a peculiar way so as to form a continuous whole of a quite unique nature.

When I see a patch of white, or when I lay my hand on the surface of a table, or plunge it in hot water, I experience a complex of sensations differing in local sign. If, now, I attempt to analyse such a complex into its component parts, I find that each discernible part runs into and is continued into others; the ending of each is the beginning of another. In other words, the whole is sensibly continuous—an unbroken unity. Further, if I attempt to sub-divide the parts so as to reach absolutely simple components which have no extensity, I find that I fail. Every explicitly distinguishable part of the extensive whole is itself more or less extensive. Finally, I reach a limit in the process of sub-division where I can no longer make explicit distinctions at all. I am still aware of an

extensive whole; but I cannot pick out its parts severally for separate consideration. I am aware of the parts only implicitly in being aware of the whole containing them.

What this means is well brought out by experiments in which two neighbouring points of the skin are simultaneously touched, *e.g.* by the two points of a pair of compasses. If the two points of the skin are sufficiently far apart, we have what may be called a perception of *apartness*; we are aware of two contact-sensations as separated and connected by an interval. But when the points lie nearer to each other this is not so. We then fail to single out separate contact-sensations from the whole tactual presentation. None the less, our sense-experience is not the same as it would be if only one compass-leg touched the skin. The sensation due to the double contact is more extensive or diffused. It is blurred, spread out, and referred to a wider area. The local sign differences are, therefore, still present, though they are not separately singled out. That they are really present is shown by the fact that it is frequently possible to discern the two touches separately when the compass-points are applied successively instead of simultaneously. This is especially easy when the first point is removed before the application of the second. Another fact which points in the same direction is that the power of perceiving apartness improves greatly and rapidly with practice. Practice cannot create the local sign differences. It can only give greater ability in discriminating them.

We shall find reason for regarding the implicit apprehension of local sign differences as more primitive than the explicit distinction of the parts of an extensive whole and the awareness of relation between them in the way of apartness, position, direction, and distance. The most rudimentary forms of extensity, belonging to other senses

than those of sight and touch, and including also, as we shall see, certain sorts of skin-sensation, do not seem capable of this kind of development.

Organic sensations, for example, such as those of hunger, thirst, repletion, headache, etc., are more or less diffuse. But we do not seem capable in their case, except perhaps in an extremely rudimentary way, of singling out the several parts of the extensive whole. We cannot, for instance, separate off by lines of demarcation a portion of a diffused stomachache or headache so as to discern the way in which it is bounded by other parts and thus become aware of it as having a definite shape.

The same indefiniteness seems to attach to cutaneous pain-sensations, such as the smart of a bruise or a blow or a burn. Where an extensive presentation is thus apprehended without explicit apprehension of the distinction and relation of its parts, we may say that there is a crude or inarticulate awareness of extensity. On the other hand, where there is explicit apprehension of apartness, position, shape, etc., we may call this developed or articulate awareness of extensity.

Why have we, in the preceding exposition, spoken only of *extensity* and not of *extension*? The reason is that we are here dealing with sensations and not with external objects. Extension is an attribute of bodies, which exists, persists, and changes independently of the coming and going of sense-experiences in individual minds. When we walk towards a tree or other visible object, the visual sensation through which we perceive it increases in extensity the nearer we approach it. But the extension of the thing seen does not therefore alter. When we look at the full moon we have a visual presentation very much smaller than we should have from a frying-pan held out at arm's length. But the extent of the moon's surface which is turned

towards us enormously exceeds the extent of the surface of the frying-pan. The extensity of the visual presentation of the moon is not measurable in inches, feet, or miles at all; for these are measures, not of extensity, but of extension. On the other hand, we may roughly measure the extensity of the visual presentation by saying that it constitutes a certain proportion of the whole extensity of the field of vision: that, for instance, this field as a whole is equal to so many full moons.

The same distinction may be also illustrated in the case of touch. Different areas of the skin equal in extent yield sensations of very variable extensity when they are stimulated. Contact with the tip of the tongue or the drum of the ear yields a much more extensive sensation than contact with the nape of the neck or the small of the back. The difference is not difference in the extent either of the skin-surface which is touched or of the surface of the body touching it. It is a difference only in the extensity of the contact sensation. Doubtless the awareness of extensity, whether crude or articulate, is inseparable from some awareness of extension, correspondingly crude or articulate. But it is equally clear that the two are not identical.

§ 5. **Change-sensations.**—When a series of different sensations belonging to the same class, colours, for instance, or sounds, follow each other continuously so that the end of each overlaps or coincides with the beginning of the next, there arises as an inseparable aspect of the whole successive complex a peculiar experience which we may call "change-sensation."[1] This does not consist merely in the fact that one sensation comes after the other. Its

[1] Cp. H. J. Watt, *British Journal of Psychology*, vol. iv., Part II., p. 157.

distinctive character is that the process of transition itself is felt in a peculiar way.

One case of the general rule is afforded by the immediate experience of motion. This is closely connected with extensity. It arises within an extensive continuum when a sensation otherwise similar continuously varies in local sign, so that there is no discernible interval between the old local sign and the new. This happens, for instance, when we pass the point of a lead pencil across the skin of the hand, or when we so move the hand that the different parts of the skin touch the pencil point in unbroken sequence. The resulting experience cannot be analysed without remainder into a mere succession of local sign differences. There is also a peculiar aspect of the experience corresponding to the transition between them. Two points in contact with the skin may be so close to each other as to produce contact-sensations which cannot be separately discriminated. Yet, if one of the points moves towards the other, so as even to decrease the interval, the peculiar motion-experience may be distinctly discernible. In this way, the existence of motion may be perceived, when we cannot determine in what direction it is taking place, and though we cannot make out where it begins.

Another illustration is supplied by presentations in the extreme margin of the field of vision. These are indefinite, so that apart from previous knowledge it is impossible to make out their shape or number. But if they move there is at once a well marked motion-sensation, although we may not be able to distinguish the direction of the displacement.

CHAPTER II.

Differentiation of Sense-experience and its Psychical Significance.

§ 1. **The Sensation-reflex.**—Reflex action is primarily a physiological, not a psychological, fact. It does not depend on consciousness at all, but only on a stimulus affecting the nervous system. The stimulus may evoke its appropriate response in the way of movement without giving rise to sensation. In this way the pupil of the eye contracts or dilates with various degrees of illumination. The movements of the frog whose brain has been removed seem to be of the same type. Those reflex movements which belong to the ordinary and normal routine of the vegetative life of the organism are almost wholly physiological. The heart's beat and its modifications, the constriction and dilatation of the blood-vessels, breathing, swallowing, the secretion of saliva, and the like, are not normally accompanied by distinctly appreciable sensations.

Unconscious reflexes of this sort normally occur when all that is required is a regular and uniform reaction in response to conditions which are uniformly and regularly recurrent. On the other hand, where a stimulus is of comparatively occasional occurrence and prompts a special combination of movements to meet a special emergency, merely reflex action without concomitant sensation ceases to be sufficient. It becomes necessary or advantageous for the ends of animal life that the attention of the subject should be called to the situation. Attention may be

required in order to form associations which make possible preventive measures or other preadjustments when similar conditions recur in the future. Thus, a young child may withdraw its hand from the burning flame by reflex action alone. But this does not account for its future refusal to touch fire. Attention may also be required to arrest or control a reflex action, as when we suppress an inconvenient sneeze or cough.

Now, in such cases, there is only one efficient way in which attentive consciousness can be brought into play so as to supplement or control the reflex process. The stimulus which evokes, or tends to evoke, the reflex movement must also coincidently give rise to a sensation. Further, this sensation must be emphatic. It must be so vivid and so strongly pleasant or painful that it cannot be easily ignored. Hence when the stimulus which leads to reflex action also produces a discernible sensation, this is commonly of a peculiarly obtrusive character. The pupil expands or dilates with varying intensities of light without any concomitant sensation. This is a merely physiological reflex, not a sensation-reflex. But if a speck of dust gets lodged in the eye the case is otherwise. The stimulus not only elicits the reflex movement of closing the eyelid; it also, at the same time, gives rise to an intense and intensely disagreeable sensation. Even reflexes which normally proceed unconsciously, or with only a comparatively faint accompaniment of sensation, compel attention in this manner when they are in any way obstructed. Obstructed breathing, for instance, is accompanied by the feeling of suffocation or stifling.

§ 2. **Perceptual Value of Sense-experience.**—The importance of the sensation connected with the sensation-reflex is primarily dependent on its power to rouse attention through its own intensity and affective tone. The value

of sense-experience is similarly conditioned by its own obtrusiveness wherever its function is to challenge attention to some change directly and seriously affecting the welfare of the organism, as when a part of the body is cut or bruised, or when a light is so strong as to impair the power of vision by dazzling the eye. In such cases, what is important is the nature of the bodily change as directly affecting the well-being of the organism rather than the special character of the agent which produces it. A cut or bruise may be produced indifferently by a stone or a piece of wood or a knife. However it may be conditioned, the resulting mischief is similar and the sensations immediately due to it are similar.

But sense-experience has another function besides that of compelling attention to incidents immediately affecting the welfare of the organism at the moment. It serves also to regulate and guide the detailed development of such complex actions as that of a cat hunting a bird, or of a bird building its nest, or of a woman threading a needle. Processes of this nature involve delicate adjustment of movements and coadjustment of many movements in response to constantly varying external circumstances; and, in so far as they are not purely instinctive, they are conditioned not by the mere existence of sensuous impressions but by their acquired meaning and, in general, by their preformed associations. What is important here is not the obtrusiveness of single sensations, but the perceptual *value* of complex combinations of different presentations as yielding discrimination and recognition of external objects, their changes and their relations. This perceptual value in its higher development is incompatible with any special obtrusiveness of single sensations due to their own vividness and intense pleasantness or painfulness. For the obtrusiveness of the sensation, as such, would distract

attention from its acquired meaning, and the ideal revivals which it calls up, and the general course of the action which it contributes to guide.

Thus the development of mental life is connected with gradual decrease in the relative prominence of single sensations and increase in the perceptual value of groups of sensations; and this involves a corresponding difference in the nature of sense-experience itself. The more developed is perceptual consciousness the more delicately differentiated is sense-experience. In other words, there is a finer correspondence between differences in the nature of the external stimulus, and differences in the sensation produced. With this finer differentiation is connected more definite restriction. The more delicately discriminated sensations are, the more capable they are of co-existing simultaneously in the same consciousness without mutual interference or amalgamation.

The distinction between what we call the higher and lower senses rests on this contrast between the intrinsic impressiveness of sensations and their value for perceptual consciousness. Organic sensations, temperature sensations, smells and tastes are relatively low in the scale. On the other hand, sensations of touch proper, of sight, and of sound are relatively high. The relatively higher senses deserve this title in proportion as they are more delicately discriminative and more capable of being combined in successive and simultaneous groups and series while preserving their distinctive differences. On the other hand, each several sensation is proportionately less important through its own intensity and pleasant or painful character.

We find the same antithesis when we compare more primitive with more advanced stages in the development of animal life. Broadly speaking, lower modes of sentience

come earlier than higher. Even what we now call the higher senses, such as sight and hearing, in their beginnings in the ascending scale of animal life, partook of the character of the lower and were probably more or less akin to organic sensations. "Colours," says Dr. Ward, "are with us so distinct from sounds that—except as regards the drain upon attention—there is nothing in the intensest colour to affect the simultaneous presentation of a sound. But, at the beginning, whatever we regard as the earliest differentiation of sound might have been incopresentable with the earliest differentiation of colour, if sufficiently diffused, just as now a field of sight all blue is incopresentable with one all red. Or, if the stimuli appropriate to both were active together, the resulting sensation might have been what we should describe as a blending of the two, as purple is a blending of red and violet."[1] Thus "increased differentiation seems to be intimately connected with increased 'restriction.'"[2] With differentiation and restriction there is loss of the intensity and of the intrinsic pleasantness or painfulness of the sensation itself. Any direct effect produced by its own intrinsic intensity and affective tone would interfere with its value as a vehicle of meaning—as an indication of something beyond its own existence. Thus, as perceptual consciousness becomes relatively more prominent and important, sensation is more delicately differentiated, more definitely restricted, less intense, and less strongly toned in the way of pleasure or pain.

§ 3. **Differentiation of Sense-Organs.**—Degree of discriminative sensibility corresponds broadly to the complexity and differentiation of the organs of sense. If the

[1] *Op. cit.*, p. 556. [2] *Ibid.*

nerve-fibres running to the skin in human beings are laid bare and directly stimulated, "then, however they be stimulated, be the stimulus weak or strong, if consciousness be affected at all, the affection takes on the form of pain; psychological examination of the subjective result discloses nothing that can be called a sensation of touch."[1] Touch- or pressure-sensations, delicately differentiated as they are, and almost neutral in tone, and capable of combining in one moment of consciousness a great variety of qualitative differences, can only be developed by the help of special terminal organs. But cutaneous pain-sensations, and all organic sensations which are vague, diffusive, and strongly-toned, arise without the help of highly differentiated end-organs. Now, in the ascending scale of animal life, we find a growing complexity and differentiation of the terminal organs of sense and of their nervous connexions, marking a correspondingly graduated displacement of sensational by perceptual consciousness.[2]

In following the ascending scale of animal life, we find a gradual evolution of specialised structures for the reception of special kinds of external stimulation; beginning with those which are scarcely distinguishable from the general surface of the body, and ending with such elaborate organs as the human eye or ear. The best illustration is drawn from sight, because most is known about it. It must be understood that the word "sight" is here used to mean merely "sensitiveness to light." It must not be assumed that the sensations produced by luminous vibrations are the same in the higher organisms as in the lower.

[1] Foster, *Text-book of Physiology*, p. 1427.

[2] This is only meant as a broad and schematic statement. In this or that special direction an animal lower in the scale may have a more differentiated sensibility than an animal higher in the scale.

A very rudimentary beginning of a special structure for the reception of light-stimulation consists simply in groups of pigmented cells with a nervous connexion. The pigmented material occurring in a semi-transparent organism arrests and absorbs the light. The limpet has eye-spots of this simple kind "on the outer side of the tentacles where the eyes are situated in more highly organised species."[1] The skin is thrown into a pit within which the epithelial cells are elongated and pigmented.

The next step is the development of a lens for condensing the light in the manner of a burning-glass. Some species of worms have only pigmented cells, others have a concentrating apparatus. These simple eye-spots, consisting of pigmented cells and a vitreous body or condensing lens, may exist in great numbers over the general surface of the organism. Thus in a species of worm called *Polyophthalmians* there is a series of eye-spots "along the sides of the body, in pairs from the seventh to the eighteenth segments."[2] Such rudimentary organs can only serve to render the creature sensitive to degree of illumination, to the transition from light to darkness; they thus make possible a protective reaction when the shadow of an approaching object falls on the animal.

The next important step is the development of a rudimentary retina, essentially consisting in a layer of rod-like nerve-endings. The eye of the snail is situated on its hinder horn or tentacle. It consists of a cornea or transparent horny integument, a lens, and a retina composed of three layers, (1) the rods, which are the proper organ of vision, (2) a cellular layer, (3) a fibrous layer. "In all probability the eye does little more than enable the snail to distinguish between light and dark. . . . It does not seem

[1] Lubbock, *The Senses of Animals*, p. 139. [2] *Op. cit.*, p. 134.

to be aware of an object unless it is brought within a quarter-of-an-inch of its tentacle."[1] The rods of the retina in which the optic nerve terminates in all probability merely render the animal differentially sensitive to different directions of the light.

In many animals which possess these retinal rods the formation of an image in any way comparable to that thrown on the retina of the human eye is impossible from the position and convexity of the lens. These eyes with rudimentary retinas, more or less sensitive to direction, may be spread in great numbers over the surface of the body. There are certain species of a genus of sea-shore slugs called *Onchidium* which have these scattered eye-spots in varying numbers, some a hundred, others as few as twelve. The number differs in different individuals of the same species, and the eyes "are continually growing and being re-absorbed."[2] The back of the *Onchidium* contains a number of glands, each opening by a minute pore; and it has been suggested that, when warned by the shadow of certain flying-fish which come out of the sea to prey upon them, the little slugs emit a shower of spray and so drive off their enemy.

The next stage in the development of the eye is the fortmaion of a retinal image by means of a lens; it is necessary for this that each diverging pencil of rays from a point in the object shall be brought again to a focus in one point, and in only one point, of the retina. The delicacy and perfection with which this is effected depends on the complexity of structure of the retina, on the nature of the lens, and on the power of adjusting it for different distances. Cuttle-fish and their allies have well-developed

[1] Lloyd Morgan, *Animal Life and Intelligence*, p. 293.
[2] Lubbock, *The Senses of Animals*, p. 143.

apparatus for the formation of images. So have vertebrate animals, but of course in varying degrees. Many fishes do not distinguish their food (worms) at a greater distance than three or four feet. On the other hand, some of them have very accurate vision for short distances. "I have often seen," says Mr. Bateson, "a large Wrasse search the sand for shrimps, turning sideways, and looking with either eye independently, like a chameleon. Its view is so good that it can see a shrimp with certainty when the whole body is buried in grey sand, excepting the antennae and antennae plates."[1] Some reptiles and amphibians have similar accuracy of vision at short distances.

Besides this main line of development of the visual organ which leads up to the eye of vertebrates, with its apparatus for forming a distinct image by means of a lens and delicately sensitive retina, there is a branch line which leads to the compound or facetted eye of insects and of crustacea such as crabs and lobsters. The surface of these compound eyes is divided up into a great number of hexagonal areas, each of which is called a facet, and in some insects forms a little lens. A kind of dragon-fly is stated to have twenty thousand of these hexagonal facets. Beneath each facet is a crystalline cone, with its base towards the facet and its apex turned inwards, where it ends in great elongated cells; in the midst of these there is a nerve-rod. Dark pigment is developed round each of the cones. "Starting from a simple form of eye consisting of a lens and a nerve-fibre, we should arrive at the compound eye by bringing together a number of such eye-spots, and increasing the number of lenses, while the separate cells beneath each lens coalesced to form a single crystalline cone and rod."

[1] Quoted by Lloyd Morgan, *Animal Life and Intelligence*, p. 287.

As regards the way in which these eyes perform their function, there has been much dispute. One explanation is to the effect that the facetted organs, taken collectively, fulfil in a different way the same office as the lens in the eye of vertebrates. Only those rays of light which go straight through a crystalline cone affect the nerve-rod. All the rest, which strike the cones obliquely, are absorbed by pigment. Thus, each of the cones conveys to its own nerve-rod a single minute spot of light coming from a single point in the field of view, and from that point only. The result is what Lloyd Morgan calls a "stippled image,"[1] The range of vision with such eyes is much smaller, and the image which they form must be far less accurate and distinct than in the higher vertebrates.

[1] *Op. cit.*, p. 290.

CHAPTER III.

Organic, Cutaneous, and Motor Sensations.

§ 1. **Organic Sensations.**—Some sensations are due to stimuli in the interior of the body: others are due to stimuli affecting sense-organs situated on the external surface of the body. Thus we have a broad division into internally and externally initiated sense-experiences. But this distinction is not, in itself, fundamentally important from a psychological point of view. What we are interested in as psychologists is the intrinsic resemblance and difference of various sense-experiences rather than the mode in which they are produced. But there is no well-marked common character distinctive of internally conditioned sensations as contrasted with those occasioned by external stimuli. The sensations of nausea, cramp, or headache are internally initiated; the smarting sensations arising from a wound or blow are initiated from without. The sense-experiences which accompany the varying positions and movements of a limb are, for the most part, due to the excitement of nerves ending in joints, tendons, muscles, and bones; sensations of contact and pressure arise from impressions on the surface of the body. None the less, both as regards intrinsic nature and function in the mental life, a headache sensation has more affinity with the smart of a blow than with the sensations connected with the position and movement of a limb; and the sensations of contact and pressure have more affinity to muscle, joint,

and tendon sensations than to the smart of a blow or a bruise.

Hence, the distinction between external and internal stimuli does not of itself supply an adequate basis for the commonly recognised distinction between organic sensations and those of the special senses. The difference is more fundamental. Organic sensations have their source in such bodily processes as affect the nutritive or vegetative life of the organism; their stimuli are to be found in the varying condition of the blood supply, the digestion and assimilation of food, the secretions, the supply of oxygen by breathing, and, generally, on such changes as make a difference to the efficiency of the bodily tissues in the performance of their vital functions. On the other hand, the sensations of the special senses arise from sense-organs specially adapted to respond to certain kinds of stimulus without reference to their effect on the vegetative life of the organism.

Probably the most primitive sensations were organic. They corresponded very closely with the general vital action of stimuli as distinct from their action on specially differentiated sensory apparatus. "Even now we are still aware of the general effects of light, heat, fresh air, food, etc., as invigorating or depressing apart from their specific qualities."[1]

As illustrative examples of organic sensations we may take hunger and thirst. These experiences are partly due to the state of the stomach and pharynx: they consist in vaguely localised gnawing sensations which normally disappear when food or drink is taken. The exact way in which the food or drink acts so as to produce this effect is, however, obscure. The state of the stomach is not the only

[1] Ward, *ibid.*, p. 562.

or the most fundamental condition of hunger and thirst. "A dog feels hunger after the complete removal of the stomach." "A man is usually less hungry after his ten hours' fast which has included the night's rest than after a four hours' abstinence in the working day." In both cases the stomach is equally empty. The difference depends on the processes of waste and repair which have been going on in the tissues of the body. The injection of nutritive material or of fluids into a vein relieves the hunger or thirst without introduction of drink or food into the stomach. "The feeling of hunger is relieved, is even converted into a pleasurable satiety, before the blood is saturated with absorbed material."[1] It thus appears that, apart from the state of the stomach itself, the general character of the supply of blood and lymph which bathe the tissues and condition their vital processes is of essential importance.

The muscle, joint, and tendon sensations which are connected with the position and movement of our limbs belong to special senses, for position and motion are common to our bodies and other parts of the material world. But the sensations of muscular cramp and fatigue are organic; for they arise from changes in the state of the muscles which affect their vital efficiency. Fatigue, for instance, seems to be conditioned by the accumulation of waste products in the blood due to muscular action. It may be removed by the injection of fresh blood.

The smart of a wound, bruise, or burn is essentially similar in character. "The temperature at which the skin begins to evoke pain is that at which nerve-substance begins to suffer injury. The sensation caused by the pressure of a sharp point (*e.g.* a needle) on the skin is felt

[1] Sherrington, in Schäfer's *Text-book of Physiology*, vol. iii., pp. 991-2.

to be painful just below the pressure sufficient for the instrument to break into the skin, *i.e.* the stimulus becomes painful just before it does injury."[1]

In general, organic sensations lack distinctness. Though, for example, they have extensity, so that we can speak of them as being more or less diffuse, yet their extensity is crude, so that we cannot separately discern its parts and their relation, or apprehend anything which can be called a shape or outline. On the other hand, they are very important as conditions of affective consciousness and consequently of conative consciousness. What we ordinarily call bodily pleasures and pains and bodily appetites are in the main connected with organic sensations. Such sensations constitute a large part of our immediate sensuous experience in every moment of our conscious lives. Our vague total awareness of bodily well-being or discomfort, our "feeling well" or the reverse, depends on an indefinite multitude of impressions reaching the brain from the internal organs, giving rise to sensations which in the main are subconscious and only confusedly apprehended. Total experiences of this kind are called states of the common sensibility or the coenæsthesis. Sometimes a single organic sensation, through its peculiar intensity or novelty, detaches itself from the general mass and becomes salient in consciousness; when this happens, the sensation thus singled out is usually of an intensely pleasant or painful character and obtrudes itself in an emphatic way on the attention. It is disengaged from its context and marked off as a distinct sensation of headache, or cramp, or nausea.

A further peculiarity of organic sensations, which they share only with muscle, joint, and tendon sensations, is that they can be directly produced and modified by

[1] Sherrington, *ibid.*, p. 974.

impulses proceeding from the central nervous system outwards to the bodily organs and leading to more or less widespread changes in the action of the heart and lungs, in the circulation of the blood, in the secretions, and in vital processes generally.

This influence of the varying states of the brain on organic process is always present in some degree. One of its consequences is that the stimulus of what we recognise as a single organic sensation is always more or less complex or diffused. It may originate in some special modification in the state of this or that special organ of the body; but this gives rise to nervous excitement which overflows in outgoing nervous impulses affecting other organs and so adding further constituents to the sensation. For instance, the painful sensation produced by a wound or a blow is a complex sensation depending not only on injury to the skin, but also on disturbance to respiration, circulation, and the whole motor apparatus of the body.

Even the sensations of the special senses, when they are at all intense, are accompanied, for the same reason, by further organic change and the resulting experiences. The grating of a slate pencil may set the teeth on edge; a bitter taste may produce nausea; the piercing scream of a steam whistle is disagreeable largely because of the widespread organic disturbance which accompanies it. What we call differences in the quality of pleasures and pains connected with sight and sound and other sensations of the special senses is partly, at least, traceable to this escort of organic experiences. "The fife's shrill clarion or the echoing horn" have organic effects different from those of a thunder-clap or of the wind whistling down a chimney.

§ 2. **Cutaneous Sensations.**—The skin yields a variety of sensations which are roughly divisible into four classes: (1) Sensations of touch proper, contact or pressure;

(2) sensations of heat and of warmth; (3) sensations of cold and of coolness; (4) sensations of an organic character, which are called pains because they are, as a rule, intensely disagreeable.

Much has been done recently towards the further analysis of these experiences and the discovery of the conditions on which they depend. In the first place the surface of the skin has been explored in minute detail by means of delicate apparatus expressly devised for the purpose. In the second place, a very instructive experiment has been made by Dr. Head, who severed a bundle of nerve fibres supplying the surface of the skin of his own arm and then observed the result, especially the gradual return of lost sensibility as the nerve fibres grew again. In the third place, much help has been obtained from pathological cases, in which some varieties of cutaneous sensation disappear while others remain.

The exploration of the skin by punctate stimuli shows that it contains a mosaic of tiny sensorial areas, each yielding a certain special sort of sense-experience and apparently no other. Its sensibility to touch, pain, cold, and heat is not distributed uniformly over its surface. There are a multitude of minute spots, of which some give only sensations of touch, others only sensations of heat, others only sensations of cold, others only sensations of smarting or pricking pain.

The adequate stimulus for touch-sensations is mechanical, consisting in the pushing of the surface of the skin inwards, or the pulling of it outwards. The adequate stimulus for temperature sensations is an increase or diminution of the temperature of the skin beyond a certain limit, which varies according to the pre-existing state of the end-organ. The adequate stimulus for pains is damage or threatened damage to the skin and the nerves

which terminate in it. But some spots are also found to respond with their own distinctive sensations to inadequate stimuli. For instance, heat of from 45° to 50° C. applied to a cold spot produces a sensation, not of heat, but of intense cold. However a sensory spot may be stimulated, if it responds to the stimulus at all, it always responds in the same way. If a fine needle be thrust into a touch-spot, there is "a sharply localised sensation of pressure unaccompanied by smart or sting or any painful quality. . . . The sensation is unaccompanied by cold or warmth even when a cold or warm needle is employed."[1] Touch-spots, heat-spots, cold-spots, and pain-spots are, in general, intermingled with each other in varying proportions in different parts of the skin. The tip of the finger is especially rich in touch-spots, the cheek in heat-spots. It is the cheek "to which a washerwoman holds her iron when forming a judgment of its temperature."[2] The cornea, *i.e.* the transparent part of the outer membrane coating the eyeball, is furnished almost exclusively with pain-spots. On the other hand, pain-spots are few within the cavity of the mouth, and absent from certain parts of the inside of the cheek.

In distinguishing special areas for pain-sensations, it is not implied that no other cutaneous sensations are disagreeable. They may be agreeable or disagreeable according to their varying intensity, duration, and other conditions. What is distinctive of pain-sensations is that they seem to be nearly always unpleasant, that their unpleasantness is peculiarly obtrusive, and that they have a stinging, smarting, or pricking character.

The touch-spots, heat-spots, cold-spots, and pain-spots are especially sensitive to their appropriate stimuli. But

[1] Sherrington, *op. cit.*, p. 921.

[2] Halliburton, *Physiology*, p. 767.

cutaneous sensation does not depend entirely on them. "The skin is sensitive to diffuse light touch (*e.g.* to the touch of cotton wool) when punctate exploration fails to show the existence of touch-spots."[1] Sensations of warmth and coolness as distinguished from heat and cold do not depend on special warmth-spots or coolness-spots. They are aroused by weaker stimuli than those which excite feelings of heat or cold.

When the bundle of nerve fibres supplying a certain region of the skin is cut through, the immediate result is, of course, the abolition of all sensations depending on end-organs situated at the surface. None the less, it is still possible to produce sensations by impressions on the skin. These are due to the stimulation of sensory organs lying underneath the surface, supplied by nerve fibres coming from other bundles—those which also send fibres to muscles, joints, and tendons. It is, in this way, possible by relatively heavy pressure to elicit touch-sensations and also pain-sensations. But, under such conditions, there are no sensations of temperature; and there are no sensations of pressure or pain so long as the stimulation is confined to the skin itself, and is not communicated to underlying tissues. "A fold of the subject's skin may be gently raised between finger and thumb and even powerfully squeezed; yet the subject experiences no sensation of touch or pain."[2]

What is most interesting to us, however, is the manner and degree in which the "heavy" touches are *localised.* To understand this, it is necessary to distinguish two different and relatively independent kinds of localisation. The first is tested by requiring the subject merely to indicate what part of the skin has been touched. He

[1] Myers, *Text-book*, p. 10.

[2] Myers, *An Introduction to Experimental Psychology*, p. 4.

either keeps his eyes closed throughout the experiment, and then, without opening them, attempts to indicate the spot at which the experimenter has touched him; or opening his eyes, the subject endeavours to mark this spot on a life-size photograph of the region (*e.g.* the arm) under examination.[1] Now, estimated in this way, localisation for "heavy" touches is remarkably accurate.

But there is another kind of localisation. By "localising" we may mean the perception of the position and direction of tactual or other sensations relatively to each other. This involves the perception of *apartness*, the discernment of two simultaneous sensations as end-points of an extensive interval separating and connecting them. This distinction of two sensations as being two, and as having an interval between them, is absent where there is nothing but heavy contact. For some time after the severance of the nerve, Dr. Head was unable thus to distinguish simultaneous pressures on the part of the skin affected. They appeared to him as a single blunt or diffuse pressure. Yet two sensations were discriminated as two when pressure was applied successively instead of simultaneously to neighbouring spots of the skin.

The fibres of the divided nerve grew again gradually in such a way that various sorts of skin-sensation returned more or less separately from each other until a normal state of sensibility was recovered. I quote Dr. Myers' account of the earlier stages.[2] Forty-three days after the operation islets of sensibility to pain "arising from stimulation of the skin itself made their appearance within the insensitive area." One hundred and twelve days after the operation, "there was . . . evidence of the first return of sensibility to cold." Twenty-five days after this,

[1] Myers, *ibid.*, p. 3.

[2] Myers, *Experimental Psychology*, Ch. I.

"the whole area had recovered sensibility to cold; but was insensitive to heat. Only a very small area now remained which was insensitive" to the pain of skin pricks. "One hundred and sixty days" after the severance of the nerve, "a patch of the affected area first became sensitive to very light touch." At the end of one hundred and ninety days, "cold was everywhere appreciable, and thenceforth the number of heat and cold spots increased rapidly. At this point, therefore, we have reached a stage when the touch-spots were just beginning to resume their function, and the sensations of cold, heat and pain spots were already fairly restored."

The various sensations experienced at this stage showed certain characteristic peculiarities sharply contrasted both with those due to heavy pressure and with another form of sensibility which developed subsequently, and has been called "epicritic." As distinguished both from deep and from epicritic sensibility, the cutaneous experiences, at this point, belong to a class known as "protopathic." They are distinguished partly by the special modes of stimulation on which they depend, and partly by their intrinsic nature. The touch sensations are indeed due to the skin itself, and not to pressure transmitted to underlying tissues. But they are excited only over hairy regions of the skin and are due to touch-spots connected with hairs. They are elicited only by touching the hairs and do not occur when the hairs have been shaven off. Temperature sensations are excited only by stimulation of heat-spots and cold-spots. These spots react explosively, so that the intensity of the sensations depends on the end-organ which is stimulated rather than on the intensity of the stimulus. But they react at all only to high degrees of heat and cold, being insensitive to intermediate temperatures. The heat-spots never react to temperatures below 37° C., the cold-

spots never react to temperatures above 27°. In general, protopathic skin sensations arise only through stimulation of the end-organs of separate sensory-spots; and in the case of touch-sensations, these must be connected with hairs.

As regards their intrinsic character, all protopathic sensations partake of the nature of organic sensations. They are relatively intense and conspicuously disagreeable. They possess extensity; but localisation in both its forms is very rudimentary. The general reference of a sensation to the part of the skin affected is vague and inaccurate; and relative localisation, involving the perception of apartness, is almost completely absent. The sensations are commonly referred, not to the place stimulated, but to a place remote from it. "A prick applied to the forearm, for example, is not felt as a prick at all; it sets up a widely radiating pain over the thumb; . . . the same indefinite diffuseness and remote reference characterise the tingling sensations produced by the light touch of hairs of hairy regions."[1] The stimulation of heat-spots and cold-spots also yields vaguely radiating, tingling, and remotely localised sensations.

The point of greatest interest is the failure of the power of *relative* localisation, the power of definitely discriminating simultaneous touches so as to discern their position, distance, and direction relatively to each other. In merely protopathic sensibility, the awareness of apartness is almost entirely wanting; two simultaneous sensations are not perceived as distinct end-points bounding an extensive interval interposed between them. Protopathic extensity is crude or inarticulate and it seems intrinsically incapable of becoming otherwise. It consists of an indefinite diffuseness without detailed discrimination of parts and without

[1] Myers, *ibid.*, p. 12.

definite form or outline. In this respect, protopathic sensations resemble those due to heavy pressure transmitted to underlying tissues. But where only protopathic sensibility is present, there is also a failure to indicate with any approach to accuracy the place stimulated. It is to be noted that when, with the gradual growth of the fibres of the divided nerve, the protopathic stage supervened on that of deep sensibility, even the power of localising, which existed previously, was lost. The characteristics of the earlier state were obscured by the later.

Epicritic sensibility, when it first began to appear, was confined to a small triangular patch of skin. Within this small area no protopathic sensations could be elicited. The subject was sensitive, in this region, to deep pains and pressures, but he did not experience the vague tingling touches due to contact with hairs, or the heat, cold and pain sensations due to heat, cold and pain spots. Instead of this protopathic sensibility, and in addition to deep sensibility, there was a finely discriminative sensitiveness to superficial touches, independent of the presence of hairs; there were also feelings of coolness and warmth arising on stimulation by temperatures intermediate between 26° C. and 37° C. These sensations of touch and temperature were identical with those evoked from a normal skin area as regards "their capacity for being discriminated and localised" and "in the absence of remote reference and radiation." The subject could correctly name or point to the part of the skin stimulated. Besides this he could now, for the first time, discriminate two cutaneous sensations as being separate and as having an interval between them. He could perceive apartness, relative position, and direction. Hence this form of sensibility is called *epicritic, i.e.* discriminative.

At this stage in the recovery from the effects of the

experiment, protopathic without epicritic sensibility had returned over almost the whole of the region affected by section of the nerve. Only in one small patch were epicritic sensations present; and within this patch they occurred in separation from the protopathic so that they could be examined by themselves. The restoration of normal conditions required that protopathic sensibility should be recovered by the small triangular patch and that epicritic sensibility should come back to the rest of the region affected. Both these processes took place slowly and gradually.

The power of relative localisation, and consequently the appreciation of relative position and direction, and of shape, seems clearly to demand as an indispensable condition the presence of the epicritic system of sensations. But it is still a question whether the mere presence of epicritic sensation is by itself sufficient without the cooperation of other factors. A very significant group of facts bearing on this question has been brought to light by cases of disease affecting nerves as they travel through the bulb and spinal cord between the brain and the skin or motor apparatus. Here also the work of Dr. Head is of great importance. He has examined a number of cases in which the perception of apartness was very greatly impaired over the surface of a limb, although the limb was "completely sensitive to all cutaneous stimuli." He further found that this failure of relative localisation was constantly conjoined with the loss of the muscle, joint, and tendon sensations which yield awareness of the varying positions and movements of the limb affected. In the absence of these motor sensations, the patient was able to name accurately the part of the skin touched, without seeing it. When required to point to it, he was troubled by a difficulty in finding the limb at all; but when allowed

to grope tentatively with the fingers, he came closer and might ultimately touch the very spot. Dr. Head holds that this kind of localisation is not seriously impaired. The initial helplessness in finding the limb itself is evidently due to the absence of muscle, joint, and tendon sensations connected with it.

In one case, where all knowledge of the position of the limbs, otherwise than by sight, was lost, the following experiments were performed. The patient's legs "were extended in the bed and he was allowed to see the position into which they had been placed. Then his eyes were closed and he was touched over the sole, instep and just below the knee-cap;" on being asked where the point of contact was situated "in every instance his answers were correct, even though the touch was made with cotton wool. With his eyes still closed, the leg was moved into an entirely new position, and his answers were equally correct, although he was entirely ignorant that his leg had been moved and believed that it lay extended before him. Directly he was asked to point out the spot that had been touched and which he had named correctly, he beat the bed idly, entirely unable to find the limb. With the profound disturbance of the power of recognising the position of his limbs was associated an inability to discriminate compass-points" simultaneously applied; "on the outer surface of the left leg he failed when they were separated to 15 cm. and over the front of the left thigh at 20 cm. distance."[1] At the same time there was less of the power to discern shape, size and weight. In such cases, skin sensibility was normal as judged by every other test except that of relative localisation.

Such evidence as this clearly shows that when there is

[1] Head and Thomson, "The Grouping of Afferent Impulses within the Spinal Cord," *Brain*, 1906, vol. xxxix.

no other defect in cutaneous sensibility, the perception of apartness, of shape and of size may be abolished or gravely impaired. This is not due to any peripheral condition, but only to something which takes place in the central nervous system. The lesion which produces the disturbance of function does so by interference with the course of nervous impulses travelling through the posterior columns of the spinal cord, and by interference with their further course in the mid-brain, or even in the cortex. Many cases occur where these parts are unaffected, and there is no failure in local discrimination in spite of other defects of sensation.

The explanation of these facts is probably to be found in what I have already said in discussing local signs. I pointed out (p. 215) that the immediately experienced diversity of places within an extensive whole probably depends on central rather than on peripheral conditions. Dr. Head's work strongly confirms this position. It seems to show that the immediately experienced diversity of places depends on special nervous arrangements which may be independently interfered with, although cutaneous sensibility is otherwise unimpaired. When this happens, relative localisation together with perception of size is correspondingly affected. At the same time there is loss of motor and deep sensibility because the nervous impulses from muscles, joints, and tendons follow the same course as those on which local signs depend. From the loss of motor sensibility there follows the failure to determine the position of the limb and to appreciate weight.

This interpretation of Dr. Head's results presupposes the absence of what I have called local signs, *i.e.* immediately experienced place-differences which are nothing but place-differences. But if these are absent, how is the patient still capable of absolute as distinguished from relative localisation? How can he, for instance, dis-

tinguish contact with the sole from contact with the instep? The reason is that, except for the absence of local signs proper, the sensibility of the skin is otherwise unimpaired, and that this varies owing to peripheral conditions in complex and finely differentiated ways for different parts of the sensitive surface. "Scarcely two portions of the sensitive surface of the human body are anatomically alike. Not only in the distribution and character of the nerve endings, but in the variety of the underlying parts—in one place bone, in another fatty tissue, in another tendons or muscles variously arranged—we find ample ground for diversity in the local colouring of sensation."[1] These local colourings are wrongly identified by Dr. Ward with local signs proper. They may be regarded as secondary or auxiliary local signs; but they cannot fulfil the function of the unique experience of place-difference which is centrally and not peripherally conditioned. What seems to follow from Dr. Head's researches is that such local colouring affords a sufficient basis for absolute localisation when an ideal representation of the spatial relations of the body has been already acquired through past experiences. But it does not make relative localisation possible.

When there is nothing to discriminate, there can be no discrimination. Hence the abolition of local signs proper involves the abolition of the perception of apartness and other relations which presuppose it. But we must be on our guard against assuming the inverse proposition—that where local signs proper are present, this by itself adequately accounts for the perception of apartness, distance, direction, shape and size. On the contrary, there is reason for holding that the definite awareness of local distinctions and relations is to a large extent, if not wholly, acquired by a

[1] *Psychological Principles*, pp. 147-148.

gradual process involving other factors besides extensity and local signs.[1] In this process a most important part is played by experiences involving active movement with the concomitant series of muscle, joint, and tendon sensations. It is mainly through such active movement that we apprehend relations of direction, distance, and position.

It thus appears that local signs are not the sole factor on which relative localisation depends. None the less, they are of fundamental importance. Their presence or absence constitutes the difference between epicritic sensations on the one hand, and deep or protopathic sensations on the other. The varying degrees in which they are present also determine the possible fineness of local discrimination. It has been mentioned that the minimum distance between two compass points required in order that touch-sensations due to neighbouring contacts may be discerned, as separate and as connected by an interval, varies with the variable sensibility of different parts of the surface of the skin. This minimum distance is called the threshold or "liminal" distance. For the tip of the tongue, the threshold is ·1 cm.; for the tip of the finger it is ·2 cm.; ·7 cm. for the tip of the nose; 2 cm. for the inner surface of the lips; 5·4 cm. for the back of the neck; 6·8 cm. for the arm and thigh. The tip of the tongue is thus more than 60 times as finely discriminative, in this respect, as the arm or thigh.

We have to add that the *amount* of the felt interval between the two contact-sensations also varies correspondingly for different parts of the sensitive surface. "If two points kept equidistant . . . be drawn across the skin so as really to describe a pair of parallel lines, the lines will appear farther apart in some places than in others." They will appear to approach each other and

[1] Fineness of local discrimination improves greatly and rapidly with practice. Children learn gradually to appreciate spatial relation.

recede from each other. "If, for example, we draw them horizontally across the face, so that the mouth falls between them, the person experimented upon will feel as if they began to diverge near the mouth and to include it in a well-marked ellipse."[1] Similar results are obtained when contact with a continuous line or surface is substituted for contact with two separate points. The minimum length of a line required to enable us to perceive it as being a line is less than the threshold interval for the perception of apartness of two points. But in this case the direction of the line is not apprehended.

The shape of a surface pressed against the skin is discerned only when the area touched distinctly exceeds in extent the threshold for the perception of apartness. The diameter of a circle must be at least 3·3 millimetres, if the circle is to be felt as circular by the tip of the tongue, whereas the threshold interval for apartness is 1·1 millimetres. The sensitiveness of the skin of the same area for local discrimination is, in general, greater in a transverse than in a longitudinal direction, greater across a limb than along it. This makes a difference to the apprehension of shape. The cross-section of a circular tube pressed on the skin appears as if it were transversely oval; whereas a true oval, with its longer axis lying lengthwise on the skin, may appear circular.[2]

Another point which has some theoretical importance is the following: "When two skin-points (*a* and *b*) are simultaneously touched with the compass tips, the distance between them appears greater than if one point travels not too slowly from *a* to *b*."[3] The quicker it travels, the shorter appears the distance; the more slowly it travels

[1] James, *Principles*, vol. ii., p. 141.

[2] Schäfer's *Text-book of Physiology*, vol. ii., p. 943.

[3] *Ibid.*, p. 943.

the longer appears the distance. If it travels very slowly the distance may seem greater than when *a* and *b* are touched simultaneously. This shows that actual motion-experiences, when they occur, are factors in the perception of apartness, thus confirming the view that their revival by association is important when the actual sensations are not present. Another fact which clearly points in the same direction is that the power of relative localisation on the surface of a limb is greater or less in proportion as the limb is more or less used in active movements of exploration. In much used areas, such as the finger tips, local discrimination is very fine; whereas in regions comparatively little used in the active exploration of objects, such as the upper arm or the middle of the back, the reverse holds good.

§ 3. **Motor Sensations.**—Under this head we bring all sensations, not organic in their character, which depend on afferent impulses passing to the brain from the endings of sensory nerves in the organs of movement,—in joints, tendons and muscles. They are called motor because they have their adequate stimuli in the variable states of the motor organs. They are also sometimes named kinaesthetic sensations.

The function of these experiences has already been indicated. Through them we are aware of the posture and of the motion of our limbs and body, so far as this is not accounted for by sight and touch.

Ordinarily, we have some visual perception of the spatial relations of our body to surrounding things and of its parts to each other. Besides this, the cutaneous sensations which we are constantly experiencing, together with the meaning they have acquired through highly complex associations, give us normally a perception of the shape and size of our limbs and of the position of the parts of

our skin relatively to each other. Hence, if one hand, for example, touches the other, we are aware through tactual sensation that it is the hands and not other parts of our body which are in contact, though muscle, joint and tendon sensations also help in the identification. In the same way, we are aware which part of each hand is touching the other.

But conditions of this kind fail to account for our discernment of the posture and changes of posture of our limbs when they are held in various positions or moved in various directions without being seen and without contact with other parts of the body. They cannot inform us of the position of our hand when, the eyes being closed, it is stretched out in front of us or held out towards one side, or raised above the head; or of the position of the leg when it is raised to take a step. They cannot account for our ability, in the dark, to touch any selected finger of one hand with any selected finger of the other, whatever may be the initial positions of the hands and fingers. In such cases, we depend on the sensibility of muscles, joints and tendons.

Motor sensations are also of great importance in appreciating weight and resistance. Pressure-sensations, more especially those belonging to deep sensibility, fulfil this function to some extent. But the accuracy of the judgment is very much increased when sensations due to varying degrees of tension in muscles, joints, and tendons are also brought into play, as when a weight is lifted and lowered in the hand. These strain-sensations make possible the estimation of weight, even when the skin is insensitive. Where a limb is entirely anaesthetic, so that both motor and tactual experiences are absent, there is no distinction of lighter and heavier, except through inference from the external appearances of objects.

If, instead of actively initiating a movement ourselves, our limbs are passively shifted by another person, or if they are set in motion by an electric current passing through the muscles, the appreciation of changing position and of resistance is virtually unaffected. The main difference is that in the first case we are aware of the movement as due to our will, and in the second as involuntary. In pathological cases where the sensibility of the muscles, joints and tendons of a limb is lost, the patient is aware that he has attempted to move the limb in a certain way, but, with closed eyes, he has no sufficient means of determining whether the movement has actually taken place. He then proceeds on the sole clue he possesses, and assumes that the movement has followed because he has willed it, though in reality it may not have done so. If, for instance, he attempts to shift his leg or arm, he assumes that the attempted change of position has really occurred, even though the leg or arm has been held fixed in the same place.

It was once supposed that actively initiated movements involved a peculiar sort of sensation connected directly with the discharge of nervous impulses from the motor areas of the brain to the muscles, and not due to incoming impulses from joints, muscles, and tendons. The existence of this "innervation-sense," or sense of energy put forth, is now generally denied. It is hard to reconcile with the recently ascertained fact that the motor areas of the cortex yield no sensation when they are directly stimulated by the electric current, whereas sensations can be elicited in this way from the areas situated immediately behind them which receive afferent nerves from the skin and motor organs. Further, the supposed sense of innervation accounts for nothing which cannot be as well accounted for without it. It is not required to explain volition; for

buted to form them are absent. The resulting association is of that intimate kind which we have called complication. The complication is even more intimate than that between the sight of ice or of water and the tactual experiences of coldness or wetness. It follows that motor sensations must acquire the meanings which primarily belong to the associated experiences of touch and sight. This explains how and why we are constantly and immediately aware of the position of our limbs at any moment and of the direction and extent of their movements through muscle, joint and tendon sensations, independently of actual touch and sight.

It is difficult for the developed consciousness to disentangle such experiences from their associations so as to determine what meaning they are capable of conveying through their own nature and their combination with each other. Yet it is possible clearly to distinguish their presence by a suitable direction of attention. When, for instance, we crook a finger or bend our arm at the elbow, by attending to what appears to take place at the joints we can discern, besides sensations due to crumpling of the skin, etc., other sensations, more akin to touches and pressures than to any other kind of sense-experience, but much vaguer than epicritic touch. They have a crude extensity, which, when it is attended to, involves a crude awareness of extension. But there is no perception of apartness or of shape. On the other hand, as the finger or elbow is being bent, we are aware of change-sensations referred to the joints, comparable to the immediate experience of motion which we have when, for example, the finger tip is passed over the palm of the opposite hand.[1] There is, however, this important difference: that

[1] See above, Bk. II., Ch. I., § 5.

movement-sensations referred to the joints lack the definiteness which depends on epicritic sensibility. We do not discriminate simultaneously the point whence the movement has started from the point at which it has arrived. None the less, the successive phases of the motion-experience are finely differentiated, like successive pressures on the skin which excite the "deep," as distinguished from the epicritic, sensibility. We also localise in the neighbourhood of the joints the various degrees of tension felt in making an effort against resistance by pushing or pulling or lifting. In pressing my fingers against the table I can distinguish clearly between skin sensations and other similar though vaguer sensations referred to the locality of the finger-joints and of the wrist.

Of the three main organs, muscles, joints, tendons, which contribute towards the complex of motor sensations, it would seem that the muscles are of least importance, and the part they play is obscure. Tendon-sensations are certainly important for the appreciation of varying degrees of pressure and strain. "Let your arm hang down loosely by your side. Attach a fairly heavy weight by a string to the forefinger. The weight pulls the surfaces of the elbow and other joints apart; so that there is no pressure or friction of one surface against another. But you soon get the sensation of strain throughout the arm."[1]

In the apprehension of the positions and movements of a limb, it seems clear that joint-sensations play the leading part. The special importance of the joints is proved by a series of experiments carried out by Dr. Goldscheider. "This patient observer caused his fingers, arms, and legs to be passively rotated upon their various joints in a mechanical apparatus which registered both the velocity

[1] Titchener, *An Outline of Psychology*, p. 61.

of movement impressed and the amount of angular rotation. No active muscular contraction took place. The minimal felt amounts of rotation were in all cases surprisingly small, being much less than a single angular degree in all the joints except those of the fingers."[1] Anaesthesia of the skin made little difference in the result. Anaesthesia of the joints themselves greatly decreased the power of discrimination.

Sensitiveness to movement at the joints is partly dependent on the extent of the movement and partly on its speed. The same extent of movement which is discernible when the movement has a certain rapidity becomes imperceptible when its rapidity is decreased. Speed being kept constant, sensitiveness varies for different joints. With a speed of (say) ·3° per second, an excursion of from 1·15° to 1·30° in extent is just appreciable at the ankle-joint, of 9·5° to 9·8° at the hip, of ·26° to ·42° at the wrist. Given the same range of movement about the joint, the speed required to make it discernible is also different for different joints. If the rapidity required for the shoulder is 3° per second, that for the elbow, with the same range of movement, is 7° per second, that for the first joint of a finger is 12·5° per second. A much smaller and also a much slower movement is just noticeable in the case of the larger joints situated near to the body than at those which are farther away from it. If we take into account both the "speed and largeness of the excursion of the limb required to give a just discernible sensation, the sensitiveness of the shoulder is more than forty times that of the fingers."[2] Of course, both extent and speed of movement are measured as we measure the motion of the hands of a clock, in terms of the magnitude of the *angles* traversed.

[1] James, *Principles of Psychology*, vol. ii., pp. 192-193.
[2] Schäfer, *op. cit.*, vol. ii., pp. 1614-1615.

The importance of the rate of movement for sensibility to excursions of the limbs like in extent, shows that the motion-sensations of the joints are not reducible merely to a series of position-sensations, each such as might have been experienced with the limb at rest. Undoubtedly our awareness of the place of an unmoved limb depends on the presence of these "statæsthetic" sensations, as they have been called. But the awareness of motion as conditioned by the sensibility of the joints does not consist in a combination of statæsthetic sensations strung together in succession. There is in addition the unique and irreducible transition-experience. This may be discerned where there is no discernment of successive positions. "The effect of transmitting an electric current through a joint is to obliterate awareness of position, while awareness of movement (although much more obtuse than in the absence of faradization) is still preserved. . . . It is also found that a passive movement may be recognised, and yet the *direction* of movement and hence the nature of the change of position may be doubtful."[1] The special value of the joints for motion-sensations is connected with their structure. They are double organs, consisting of two sensitive surfaces, which rub against each other as the limb moves. The conditions are so far comparable to those of the mutual exploration of different parts of the skin, as when the two hands are rubbed against each other. Only we have to remember that the joint surfaces have not epicritic sensibility, but only something analogous to the deep sensibility of the skin. The contact and movement of the joint surfaces relatively to each other seems incapable of yielding the perception of the simultaneous *apartness* of two contacts. None the

[1] Myers, *Experimental Psychology*, p. 69.

less, this is compatible with delicacy in the discernment of motion-sensations and of successive position-sensations, which is all that is required to enable the joint-experiences to give, through their acquired meaning, minute and accurate information concerning the position and motion of our limbs.

Joint-sensations are, as Professor James observes, capable of *parallel variation* to all the peculiarities of external motion. "There is not a direction in the real world nor a ratio of distance which cannot be matched by some direction or extent of joint-rotation. Joint-feelings are 'roomy.' Specific ones are contrasted, *inter se*, as different directions are contrasted within the same extent. If I extend my arm straight out at the shoulder, the rotation of the shoulder joint will give me one feeling of movement; if then I sweep the arm forward, the same joint will give me another feeling of movement."[1]

The meaning which joint-sensations are capable of conveying by themselves, apart from their association with other experiences, is, as I have said, usually merged and lost in their acquired meaning. The reason is that it is the acquired meaning which alone normally interests us. A more or less parallel case is found in the use of such instruments as a pen, a knife and fork, or the surgeon's probe, or the stick with which a blind man guides his steps.

[1] James, *op. cit.*, p. 194.

CHAPTER IV.

Taste and Smell.

§ 1. **Taste.**—The greater number of the sensations which are usually ascribed to taste are in reality odours. If the nose be held and the eyes shut, it is very difficult to distinguish, in eating, between an apple, an onion, and a potato; the three may be recognised by their texture, but not by their taste. Cinnamon applied to the tongue under the same conditions appears like flour; the taste may appreciate a slight sweetness, but that is all. There are four undoubted taste-sensations—sweet, salt, acid, and bitter. What is known as an alkaline taste is held to be a blend of salt and sweet together with characteristic touch-sensations; it may be imitated by mixing strong solutions of salt and sweet substances. Metallic tastes are supposed to be due to a mixture of salt and sour.

All taste-sensations appear to be intermingled with and qualified by tactile sensations. An acid, too slight to be distinguished as such, produces a peculiar touch-sensation by its astringent character; and as the acidity is increased the touch-sensation becomes stinging, and finally passes into a pain-sensation which completely dominates the special experience of acidity. Salt is also accompanied by a stinging sensation; but this does not reach the same pitch of intensity as in the case of acids. The sensation of softness and smoothness is associated with sweetness; this is appreciable when the sweet substance is present in quantities so small that it cannot be discerned as such.

As the sensation of sweetness becomes intensified, the touch-sensation is dominated and obscured by it. But it emerges again as the sweetness is further increased. Very intense sensations of sweetness are sometimes accompanied by a biting sensation.

The tip of the tongue is especially sensitive to sweetness, the edges to acidity, and the base to bitterness. The tip and edges are equally sensitive to salts, the base less so. When the mouth has been washed out, and some neutral substance, such as distilled water, is applied to the tongue, the result differs according to the point of application, and varies in different persons. The base of the tongue appears, in general, to respond by a sensation of bitter. In some persons the same sensation is aroused to whatever part of the tongue the distilled water is applied. Others feel no sensation except at the base. Others feel a sensation of sweetness at the tips and of acidity at the edges.

There appear to exist among taste-sensations relations somewhat analogous to the contrast of colours. Salt, by a sort of contrast, makes distilled water taste sweet. It has the same effect on solutions of sweet substances which in themselves would be too weak to be appreciable. It also has an intensifying effect on solutions which are strong enough to be appreciable. It operates in this way both when the same part of the tongue is successively stimulated, first by a salt, then by a neutral or sweet fluid, and also when the salt and the sweet are simultaneously applied to homologous parts of the tongue, *e.g.* to corresponding points on the right and left edges of the tongue. Sweet has a much weaker contrast effect on salt, than salt on sweet. Sweet instead of making distilled water taste salt by contrast, makes it taste sweet. On the other hand, contrast with sweet makes distinctly appreciable a salt solution in itself too weak to be perceived. Similar relations have been ob-

served between salt and acid, and between sweet and acid; but in the case of sweet and acid they are manifested only when the two stimuli are applied successively to the same part of the tongue, not when they are applied simultaneously to homologous parts. Bitter appears neither to produce contrast effects nor to be affected by them.

There is also compensation and rivalry between tastes. When two stimuli act simultaneously on the same organs they may give rise to a sensation differing from that which either would produce separately; but they may also partially or wholly neutralise each other, as sugar neutralises the sourness of fruit or the bitterness of coffee. This is compensation. It also sometimes happens that, under such conditions, two tastes are experienced alternately as if there were a conflict between the two stimuli, now one prevailing and now the other. This is rivalry.

The sense of taste can be stimulated only by fluids. Solid substances must be dissolved in the mouth before they can affect it.

§ 2. **Smell.**—The appropriate stimulus for the sense of smell, on the other hand, consists of odoriferous particles conveyed to the membrane in a gaseous medium. The sensations of smell have not been adequately classified or analysed into their primary constituents: there appears to be a very great variety of them. They are often modified by mixture with touch and taste sensations. The pungency of an odour is not strictly a sensation of smell at all, but a peculiar kind of tactual experience. Odours proper do not appear to produce sneezing: this is due to irritation affecting the sense of touch. Odorous sensations take "some time to develop after the contact of the stimulus with the olfactory membrane, and may last very long. When the stimulus is repeated the sensation very soon dies out: the sensory terminal organs speedily

become exhausted. The larger, apparently, the surface of olfactory membrane employed, the more intense the sensation; animals with acute scent have a proportionately large area of olfactory membrane. The greater the quantity of odoriferous material brought to the membrane, the more intense the sensation up to a certain limit; and an olfactometer for measuring olfactory sensations has been constructed, the measurements being given by the size of the superficial area, impregnated with an odoriferous substance, over which the air must pass in order to give rise to a distinct sensation. The limit of increase of sensation, however, is soon reached, a minute quantity producing the maximum of sensation, and further increase giving rise to exhaustion. The minimum quantity of material required to produce an olfactory sensation may be in some cases, as in that of musk, almost immeasurably small."[1]

The sense of smell plays an immensely important part in the life of animals. It is to them what sight and hearing are to us. The animal detects its prey and follows it by means of scent. On the other hand the scent of the pursuer warns the prey and guides its efforts to escape. Probably every individual and every species has its own characteristic and distinctive odour. There are some men who can distinguish human beings by smell; dogs and other animals possess this power in a very high degree. The ants of one nest attack those of another nest or of another species who may intrude among them; whereas they never under normal conditions attack ants belonging to their own nests. It has been clearly shown by experiment that this is due to the peculiar and distinctive odours belonging to different nests and their inhabitants.

[1] Foster, *op. cit.*, pp. 1389-1390.

The unfamiliar odour of an ant coming from a strange nest has an exasperating effect. The intruder is attacked and usually killed. If before being introduced into a nest it is first bathed in juice produced by crushing the tenants of the nest, no notice is taken of it however widely it may differ in appearance from these. It is incorrect to say that ants *recognise* other ants as belonging or not belonging to their own family: all depends on the irritating effect of the unfamiliar odour of strangers.[1] The comparatively small part played by smell in the mental life of human beings may be accounted for by the fact that trains of ideas constitute so large a part of human experience. Smells are not adapted to ideal revival in serial succession as sounds and sights are.

[1] See Albrecht Bethe's *Dürfen wir den Ameisen und Bienen psychische Qualitäten zuschreiben* (*Archiv für die gesammte Physiologie.* Bd. 70). Bethe also shows that some species of ants find their way to and from their nests by means of smell. In moving they leave an odorous track behind them.

CHAPTER V.

Light-Sensation.

§ 1. **Nature of the Stimulus.**—Physically considered, light is an undulating movement of the particles of a generally diffused medium called the luminiferous ether. For our purposes, we may represent this undulating movement by the waves which pass along a rope, when it is fixed at one end and jerked up and down by the hand at the other. As the wave traverses the rope, what travels along it is not of course the material particles of the rope themselves, but only a form of movement which is transmitted from one set of particles to another. The hand may move more or less quickly; the more quickly it moves, the shorter are the waves. In the undulating movement the particles of the rope first rise above and then fall beneath their position of equilibrium when the rope is at rest. They rise to a crest, and sink into a hollow. The length of the wave is measured by the distance along the rope between the point at which this movement begins and the point at which it terminates. Longer waves traverse the rope in the same time as shorter ones; hence the shorter wave must be more frequently repeated in the same time. Thus the shorter the wave the shorter the time it takes to complete itself. The *amplitude* of the wave must be carefully distinguished from its *length*. The hand, while continuing to repeat its movements in the same time, and consequently producing waves of the same length, may take a more or less extended swing. The more extended the

swing, the greater is the amplitude of the waves that traverse the rope. The particles of the rope rise higher and sink lower; their crests are higher and their hollows deeper. Suppose now that the hand, in making its excursion to and fro, also trembles. Different kinds of impulse are then communicated to the rope, each of which separately would give rise to waves of different length. The result is waves of a more complex form which can be mathematically explained as if they were formed by a combination of the waves which the separate impulses would severally produce.

Thus we can distinguish three characteristics of an undulating movement: (1) wave-length, (2) amplitude, (3) simplicity or complexity. In the case of light, each of these characters of the physical undulation is specially connected with a corresponding characteristic of visual sensation. Differences of *wave-length* are specially connected with differences of colour-quality other than those which are constituted by degrees of paleness or darkness, viz. by more or less resemblance to white or black. Colour-quality in this restricted sense is called *colour-tone*. For example, the difference between yellow and green, or between yellow-green and a still yellower green, is a difference of colour-tone. The difference between yellow and yellowish-brown is difference in saturation due to a darkening of the yellow. The *amplitude* of the wave is specially connected with the intensity of the sensation. Any specific colour-tone, such as green or red, produced by light of a certain wave-length, may be made brighter or less bright by increasing or diminishing the intensity of the light, viz. the amplitude of the vibration. It may become brighter without alteration of its colour-tone. If we have a series of greys including what we call white, arranged in a graduated scale of brightness, it is possible

to fix the brightness of a given colour, such as green, by comparing it with the greys. It is judged to be equally bright with one of them, and more or less bright than the rest. The *complexity* of a wave determines what is called the *degree of saturation* or purity of the corresponding colour. We can, as we have seen, compare a green with a grey or white in respect of intensity or brightness: but we can also compare it in another respect: we can ask how far the green resembles the grey in quality. It may be a greenish grey or a greyish green, or apparently a pure green. The more it approximates to grey, the less saturated it is, and the more free it is from any apparent admixture of grey, the more saturated it is.

It must not be supposed that colour-tone is determined solely by wave-length, intensity solely by amplitude, and degree of saturation solely by complexity. It is only within certain limits that the physical intensity of light can be varied without affecting colour-tone. Variation in the intensity of the light also affects saturation; increase makes the colour whiter, and decrease makes it darker. Wave-length not only determines colour-tone, but also helps to determine brightness. Some colour-tones are brighter than others, even though the physical stimulus is less intense. Complexity of vibration is a very important factor indeed in determining colour-tone. The same colours which are produced by simple waves can be produced by complex waves also, though in some cases they are less pure or saturated. White or grey results from a combination of lights of all wave-lengths, and also from various other combinations. In ordinary daylight, all wave-lengths are combined.

§ 2. **Structure of the Eye.**—For anatomical detail we must refer to the text-books of physiology. The eye as a whole is analogous to a photographic apparatus. "In it

a camera or dark chamber of notable size exists similar to that which a photographer uses, having a lens in the fore part, and a sensitive curtain at the back. . . . When the photographer looks in at the back of his camera, he sees on the ground glass plate the image depicted which he wishes to photograph, placed upside down, but faithfully delineated in all its colours; and such an inverted landscape is formed in like manner in the back part of each of our eyeballs. And as the photographer adjusts the focus of his instrument by altering the position of the lens, screwing it nearer or further from the screen, so we adjust the focus of our eye instinctively according to the distance of the object looked at, not indeed by changing the position of the lens but by altering its form so as to make it stronger or weaker as required."[1]

The sensitive curtain is called the *retina*; when an object is looked at directly by a normal eye the optical image of that object is focussed upon a small oval area about the centre of the retina known from its colour as the "yellow spot." This area, in the centre of which is a minute depression or pit called the *fovea centralis*, is in an ordinary light by far the most discriminative part of the retina, and it alone gives distinct vision of an object. Near it on the nasal side, the optic nerve enters the eye and pierces the retina to send its fibres radiating over the inner surface, and the spot at which the optic nerve comes through, being insensitive to light, is called the *blind spot*. The retina, although a very thin and delicate membrane, consists of several distinct layers. In the innermost layer the fibres of the optic nerve are spread out. The outermost layer consists wholly of minute rod-like structures packed closely side by side and perpendicular to the surface

[1] Cleland, *Evolution, Expression, and Sensation*, pp. 77, 78.

of the retina. These are the elements in which the light rays produce their immediate effect, probably chemical changes. They are of two kinds, called respectively the rods and the cones, and are connected with the nerve fibres of the innermost layer by highly complex systems of fibres which make up the middle layers of the retina. In the *fovea centralis* the cones alone are present of all the retinal constituents. The proportion of rods to cones increases from the *fovea* towards the periphery, and outside the area of the yellow spot the rods predominate largely. The retina differs from all the sense-organs except the olfactory in being an out-growth of the brain.

§ 3. **Descriptive Analysis of Light-Sensations.**—We must distinguish between neutral tints and colours proper. Neutral tints consist of black and white and intermediate greys. Starting with pure black, we can arrange the greys in a series, so as to pass by gradual transitions to pure white. Each grey may be interposed between two others which it resembles so closely as to be barely distinguishable from them. It differs from the one which precedes it in being a little lighter, and from the one which follows it in being a little darker. Thus, though the greys differ, the general form of transition between them is throughout identical.

The eye is capable of distinguishing about 700 shades of grey, from the deepest black to the most brilliant white. It should be noted that though black is not due to a positive physical stimulus, as other visual sensations are, it is yet a positive experience. The eye which sees darkness is not at all comparable with the back of the hand, which sees nothing. There is reason for believing that the grey field which remains present to consciousness in the continued absence of light is due directly to a brain-process, and does not involve excitation of retinal elements at all.

Differences of colour-tone, apart from differences of saturation and intensity, are best studied in the order in which they occur in the spectrum. The spectrum is formed by passing ordinary white light through a prism, and so breaking it up into its component simple lights, and projecting these on a screen. The simple components of the white light are then arranged in a series in the order of

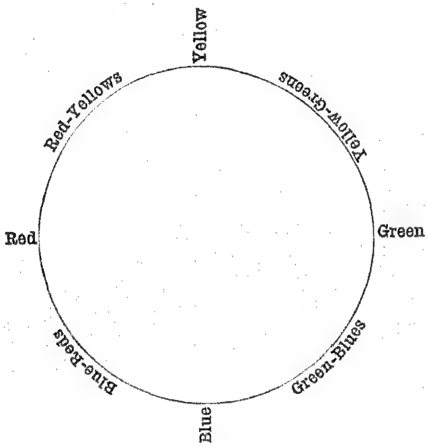

Fig. 2.—Circle illustrating serial order of colour-tones.

their wave-lengths. At one end are the longest wave-lengths, giving the sensation of red, at the other the shortest, giving the sensation of violet, viz. a blue tinged with red. Between the red end and the violet end are interposed all the various colour-tones,[1] with the exception of the purples. The purples can be formed by intermixing red and violet lights in varying proportions. In what

[1] Not of course all degrees of saturation and intensity.

follows we shall suppose the spectrum completed by the addition of these purple tints, so as to form a closed figure.

We have said that colours are best studied in the *order* in which they occur in the spectrum. But unfortunately the spectrum is unsuitable in some other respects for analytic comparison of colour-tones. In comparing a series of colours merely with reference to their colour-tones, their brightness and saturation ought to be kept as uniform as possible. But the colours of the spectrum differ greatly in brightness. Hence in what follows we shall suppose a series of colours arranged in the order of the spectrum, but uniform in brightness and saturation. Such a series may be made by taking bits of transparent coloured paper, and adjusting their degree of brightness and saturation by placing bits of grey or white paper underneath them.

The whole series of colour-tones, beginning with red and returning to red through purple, is continuously graduated, like the grey series of which we have just spoken. But there is an important difference. In the region of greatest wave-lengths, the transitions are from red to yellow; each member of the series is interposed between two others which it resembles so closely that the difference is barely perceptible, but it differs from the one in being redder, and from the other in being yellower. Thus the form of transition in the series is uniform throughout, and is quite analogous to that between black and white. But after passing yellow, there occurs what may be best described as a change of direction. The transition is still continuous; but it now takes place between yellow and green. We begin with greenish yellows, and pass by the smallest perceptible transitions to yellowish greens, and so to pure green. After passing green there is another change of direction; we now have a green-blue series. There is

still another turning-point after passing blue; the series which follows is blue-red, passing from blue through violet and purple to red. The change of colour in the spectrum is throughout so continuous that it is not possible to fix the exact point at which these changes of direction begin. All that can be said is that they begin somewhere in the region of red, yellow, green, and blue, respectively. Since the change of direction occurs, it must occur somewhere. At the precise point of its occurrence, there must be a simple colour-tone, such as pure red, pure yellow, pure green, or pure blue. For instance, pure yellow is the point of transition between the red-yellows and the green-yellows, and pure red is the point of transition between the purples and the red-yellows.

So far we have only considered difference in colour-tone, apart from difference in intensity and saturation; but all the colours of the spectrum may vary in either of these respects so as to form a graduated series. Each of them may be made more or less pale by an admixture of white light. If the general intensity of the illumination be increased or diminished while the spectrum is being examined, and if the increase or diminution is not too great, the result is that all the colours in the spectrum vary in brightness while remaining the same in colour-tone. But the change in brightness is in general accompanied by a change in saturation. Increased brightness makes a colour paler, and decreased brightness makes it darker—causes it to approximate to black. When the increase or decrease is made sufficiently great, the colour-tones tend to disappear in mere whiteness or blackness, respectively. They may be mixed with white light, and also lowered or increased in intensity, so that both changes are combined. All the colour-differences recognised in ordinary life may be accounted for in these various ways.

They are constituted by differences in primary colour tone, in intensity, and in saturation. Pink and rose-colour are whitish reds; maroon is a dark red, *i.e.* a red so diminished in intensity as to be strongly infused with black. Olive is a dark green. We usually call a pale green or blue a light green or blue. The series of colour-modifications obtained by making a colour-tone, such as blue, paler or darker is psychologically quite analogous to such a series as that of the blue-greens.

Intensity is by no means independent of colour. In the spectrum, the physical light is most intense in the region of red. But for our experience the yellow is distinctly the brightest colour. The blue is less bright than the red, but the difference is by no means in proportion to the difference in the intensity of the illumination.

It should be noted that the red of the spectrum is not pure red, but, as Hering pointed out, is tinged with yellow.

§ 4. **The Retina's own Light.**—In the total and continued absence of external light, there still exists a field of greyish light-sensation. This is perhaps due to the fact that the visual areas of the brain are continually being stimulated by such internal processes as the circulation of the blood and the re-distribution of heat. This sensation of grey due to internal stimulation has been called the *retina's own light* (*Eigenlicht der Retina*). But the name is a misnomer, if the experience depends, not on retinal process, but on more central conditions.

§ 5. **Total Colour-Blindness and Dark-Adaptation.**—The extreme margin of the retina is totally colour-blind. Let the eye be fixed upon an object immediately in front of it, and let someone gradually introduce an unknown coloured object into the field of view from one side. On its first entrance into the field of view, the object will

appear white, grey, or black. Its colour will only become recognisable as it approaches the centre of the field.

Again, when the illumination is sufficiently faint, the whole of the retina, with the exception of the yellow spot, is totally colour-blind. All the colours of the spectrum pass into grey when the light is made dim enough. When we pass from ordinary daylight into a dark room, we are not at first able to discern objects : but after a time the eye adapts itself to the faint illumination. When this dark-adaptation has taken place, it becomes possible to discern objects but not their colour-tones. Everything is seen in various shades of grey. It has been shown that the sensation of grey which persists when the illumination is so lowered that colour disappears is, in all probability, a function of the rods only. Accordingly the *fovea centralis*, in which rods are not present, does not become adapted in the same way. If a small patch of coloured light is thrown upon it, decreasing illumination causes the colour suddenly to disappear, without first transforming it into a patch of grey. Where there has been no adaptation of the eye for darkness, the same holds also for other parts of the retina. If several transparent patches of colour are illuminated from behind, and the light thus transmitted through the transparent patches is gradually decreased, while the general illumination remains that of ordinary daylight, the colours retain their distinctive hue until they give place to blackness, without first passing through intermediate shades of grey. This is expressed by saying that there is no "photo-chromatic interval," such as occurs when the retina becomes adapted to faint light.

Where the general illumination is gradually diminished so as to give rise to a photo-chromatic interval, there is also a marked change in the comparative brightness of different colours. The colours of the red end of the

spectrum appear relatively darker, those of the blue end brighter, while the region of maximum brightness passes to the green, whereas under ordinary illumination it is found in the yellow. This change of relative brightness begins before the colours become grey. But it is most pronounced after this stage has been reached.

Cases have been carefully examined and recorded of persons who showed an entire want of sensibility to colour-tones, not only under faint illumination, but under all conditions. They saw everything in black and white. In most of these pathological cases, though not in all, there is an alteration in the distribution of the intensity of light-sensation in the spectrum. For the normal eye the region of greatest brightness is that of yellow light; for the totally colour-blind, it lies in the green rather than in the yellow portion of the spectrum. We have just noticed that the spectrum, as seen under sufficiently faint illumination, shows the same change in the distribution of the brightness of its parts. The totally colour-blind cannot for the most part bear illumination of ordinary strength. They can see well in a dim light, but are painfully dazzled by full light. This indicates that their ordinary condition is analogous to that of a normal person whose eyes have been adapted to twilight vision. Colour-blindness is common to both cases. In both cases a special retinal apparatus is at work yielding only sensations of grey, while that for colour vision and for white and black is either non-existent or in abeyance.

§ 6. **Partial Colour-Blindness.**—Between the outer margin of the retina and the yellow spot, there is a zone which is partially colour-blind. It is sensitive to blue and yellow, but not to red and green. This may be tested by an experiment similar to that described in the previous section. When the colours of the spectrum are seen sideways, so

that they fall on the partially colour-blind zone of the retina, the blue-green region appears grey. This grey divides the whole spectrum into two parts. The part containing light of greater wave-length appears yellow, that containing light of smaller wave-length appears blue. Red and green are not discernible.

It is well known that there are many persons whose whole retina is affected by a partial colour-blindness, consisting in an inability to distinguish between red and green. Now, abstractly considered, this inability to distinguish between red and green may arise in either of two ways. A person who was insensitive to both red and green could not of course distinguish them from each other. But the same might hold true of a person sensitive to red and not to green, or to green and not to red. If we suppose yellow to be due to a combination of the retinal processes which are produced by red light and green light respectively, persons insensitive to red would see all yellows as green, and those insensitive to green would see all yellows as red. Both modes of explaining partial colour-blindness have been, and still are, advocated. On the whole, it seems likely that in the partially colour-blind the retina is equally incapable of giving rise to sensations either of red or green. But the question is full of difficulty. The evidence shows clearly that there are two distinct types of partial colour-blindness, and it has been maintained that in the one type the sensation *red* is absent and in the other type the sensation *green*. But instances have occurred in which only one eye has been colour-blind, the other eye being normal. These instances have belonged to the type which would be classed as *red-blindness* by those who distinguish between red-blindness and green-blindness. Now in such cases the colour-blind themselves testify that the

colours they see with the abnormal eye are yellow and blue, and those they fail to see, red and green. They see the spectrum as composed of yellow and blue, with a grey region in which normal persons see blue-green.

If we suppose that partial colour-blindness consists in the absence of the sensations both of red and green, we must find some explanation of the difference between two well marked types which are on the opposite view distinguished as red-blindness and green-blindness. In both types it is possible, by mixing in varying proportions light from the short-waved end of the spectrum with light from the long-waved end, to produce all the colour-tones which they are capable of seeing when their retina is affected by intermediate simple lights. In type i. (the so-called red-blind), the rays at the extreme end of the spectrum, which give distinct sensations of red to the normal eye, produce no appreciable effect of any kind, and other reddish rays produce much fainter sensations. In type ii., the retina is sensitive in some way to rays at the red end of the spectrum; and in general, reddish rays produce more intense sensation of some kind than in type i. In comparing a certain reddish yellow with a yellow almost free from red, the intensity of the reddish yellow light must be made about four times greater for type i. than for type ii., in order that the resulting sensations may be indistinguishable in intensity and colour-tone. Clearly there is a great difference in sensitiveness to red light in the two types. But it by no means follows that the red light produces the sensation *red* in type ii. and not in type i. An alternative explanation is that the red light has a greater power of producing the sensation *yellow* in type ii. than in type i.[1]

[1] Professor G. E. Müller has given an elaborate explanation of how this takes place. See *Zeitschrift f. Psychologie und Physiologie der Sinnesorgane*, Band XIV., Heft 3 und 4, p. 182.

§ 7. **Effects of the Mixture of Lights of Different Wave-Lengths.**—When lights of all wave-lengths are intermingled in due proportion, the result is grey or white. If in the mixture there is a relative predominance of some one light, such as green or blue, the result is a whitish green or a whitish blue.

If we select any colour of the spectrum, it is possible to find some other colour which, mingled with it in due proportion, will yield a neutral tint. If one of the components of the mixture is present in greater quantity than is required to produce a grey, the predominant light gives its own colour to the mixture. The other light diminishes the degree of saturation. Thus, if golden yellow and blue be mixed in proper proportions, they yield the sensation of white. As the proportion of blue is increased, the white becomes more and more a bluish white; as the proportion of yellow is increased, the white becomes more and more a yellowish white. Colours which, intermixed with each other, yield white, are called complementary. Yellow is complementary to blue. The red of the spectrum is not complementary to green, but to a bluish green. It should be remembered, however, that the red of the spectrum is not pure red, but yellowish. As every discernible colour of the spectrum possesses its complement, either within the spectrum or in the purple series, the pairs of complementary colours are indefinitely numerous. If the simple lights corresponding to colours which are not too far removed from each other in the spectrum are mingled, the result is a colour corresponding to an intermediate light. For instance, by mingling the simple lights which severally produce blue and green, we can obtain all the blue greens. A larger proportion of the blue light yields a bluer green: a larger proportion of the green light yields a greener blue. If we mix blue with yellowish-green, we obtain a green

mingled with the white due to the combination of blue and yellow. This green may be relatively pure or it may be bluish or yellowish according to the proportion of blue or yellow light in the mixture. The combination of pure blue with pure yellow yields white. If, proceeding further, we mix blue with red, we obtain a new colour not contained in the spectrum—purple. By mixing the red light of the spectrum with the green in certain proportions we produce yellow: by increasing the quantity of red light, the yellow is made redder; by increasing the quantity of green light, the yellow is made greener. The laws of combination which hold good of simple lights apply also to those mixtures which produce the same colours as the simple lights.

If we select three colours so related that by combining any two of them we can obtain a colour which is complementary to the third, it is possible, by varying combinations of the three, to produce all the colours of the spectrum. But there is only one triplet of colours by which the rest can be produced in a high degree of saturation. This triplet is red, green, and a bluish violet. For this reason red, green, and violet have been called primary colours.

The best method of mixing lights of different wavelengths, so as to ascertain the resulting sensation, is to allow two different parts of the spectrum to fall on the same part of the retina at the same time. Another way is by using the colour-wheel or colour-top. Sectors of the colours to be investigated are placed on a disk. The pigments used in colouring must be as pure as possible; in other words, they must as nearly as possible reflect simple and not compound lights.[1] The disk is set

[1] The mixture of the pigments themselves, in the way that artists mix them, is by no means equivalent to a mixture of the lights which they reflect.

rapidly spinning so that one kind of light is brought to bear on the retina before the effect of the other has ceased. Thus the different modes of stimulation are superposed. If one sector of the disk is blue, and another yellow, and if the colours are present in due proportion, the rapidly rotating disk will appear grey.

§ 8. **The Effects of Contrast.**—A man passing a street-lamp in moonlight casts two shadows. That which is cut off from the light of the lamp and only illuminated by the moon appears blue. Now moonlight is white or nearly so. The blue appearance of the shadow is due to contrast with the yellow illumination thrown by the lamp on the surrounding field of view. The excitement of the retina by the yellow light indirectly affects that portion of the retina or of the central nervous matter which is not directly excited by it. The influence thus exerted by the yellow light produces an effect similar to that which would be produced by a blue light acting directly. Now blue is complementary to yellow. In general, a colour in any part of the field of view tends to tinge adjoining parts with its complementary colour. The effect is greatest when a large field of uniform colour acts on a small one. A small spot of grey on a relatively extensive field of blue appears distinctly yellowish. If a small spot of red be substituted for the grey, it will combine its own colour with the contrast colour. It will appear yellowish red or reddish yellow. The effect of contrast is most marked at the meeting-point of the two colours. It is interfered with by lines of demarcation separating them, such as a pencil-mark drawn round the red spot on the blue field. It is also interfered with by differences in the texture of the coloured surfaces. For these reasons, it comes out most clearly when contours are obliterated, and differences of texture reduced to a minimum. The most favourable con-

ditions are obtained in the case of coloured shadows, or by projecting the light from coloured glasses on a wall, or by means of coloured disks in rapid rotation with the colours in concentric zones. A simple method is to place a small piece of paper on a larger sheet, and to cover both with a sheet of tissue paper. The tissue paper obliterates contours and conceals difference of texture. The contrast effect is of course in general stronger in proportion as the direct excitation of the part of the retina affected by it is weaker; thus grey is better to experiment with than white. The influence of contrast is also operative between black and white. The same grey will appear darker on a white background, and lighter on a black background. If contrasted colours are complementary to each other, the contrast renders them more saturated.

§ 9. **The Negative After-Image, etc.**—"If, after looking steadfastly at a white patch on a black ground, the eye be turned to a white ground, a grey patch is seen for some little time. A black patch on a white ground similarly gives rise, when the eye is subsequently turned towards a grey ground," to the image of a white patch. These after-images, which follow the removal of the primary stimulation, are called *negative images*. "When a red patch is looked at, and the eye subsequently turned to a white or to a grey ground, the negative image is a greenish blue; that is to say, the colour of the negative image is complementary to that of the object. Thus also orange produces a blue, green a pink, yellow an indigo-blue negative image, and so on."[1] When the primary stimulation is very transient, it may give rise in the first instance to a positive image, as we shall see later. Negative images arise also

[1] Foster, *Text-book of Physiology*, part iv., book iii., chap. iii., p. 1266.

when the eye is simply closed after the primary stimulation as well as when it is turned to a different background.

It is not however necessary for the occurrence of negative images that the primary stimulus should be removed. The same result may be brought about by diminishing its intensity. If we steadfastly gaze at a red spot on a yellow ground, and then diminish the intensity of the illumination by turning down the light or otherwise, a green spot upon a blue ground will appear instead of the red spot on a yellow ground.

The same process is manifested in a different way while the eye is actually subject to the primary stimulation in undiminished intensity. If we gaze long and steadfastly at any colour, it gradually becomes less saturated; the effect of steadfastly gazing at yellow is the same as that produced by gradually mingling the yellow light with more and more of its complementary blue. It becomes paler. We may gather these facts under one formula. The continuance of the same mode of stimulation tends to produce a contrast effect, not only on adjoining portions of the retina, but also on that portion which the stimulus directly excites. This contrast effect takes the form of a negative image when the primary stimulation is withdrawn or sufficiently weakened. When the stimulus is continued so as to maintain its positive effect, the contrast effect mingles with this, so as to produce loss of saturation. In this way, the yellow illumination of a gas-light or candle practically becomes equivalent to white light when it is long continued. It is noteworthy that negative images modify each other's colour-tone by contrast, and this even in cases in which it is difficult to obtain a contrast effect under ordinary conditions. The negative image of a red patch on a white ground is blue-green; the negative image of the white

ground which surrounds it is reddened by contrast. This is important, because it shows that contrast phenomena are not due to errors of judgment, as has been maintained by Helmholtz.

§ 10. **The Positive After-Image, etc.**—Light acting on the retina takes a certain time to produce its full effect, and the retinal excitement takes a certain time to disappear after the stimulus has been removed. If we take a black disk with a white sector, and set it in very rapid rotation, the whole disk appears to the eye as a uniform grey. As the white sector is whirled round, it affects successive portions of the retina, but by no means so intensely as if it continued to act on the same part. Owing to the rapidity of the rotation, it returns again to the same point before the effect of the previous stimulation has become appreciably diminished. The result is a uniform grey identical with that which would be produced if the white light from the sector were equally distributed over the whole surface of the rotating disk at rest. The persistence of the visual sensation after the stimulus has ceased gives rise, under certain conditions, to what is known as the *positive after-image*. This is most marked when the eye briefly glances at an object, instead of steadfastly gazing at it. The conditions are most favourable when an eye which has for some time been withdrawn from the influence of light is momentarily exposed to a somewhat strong stimulus. "Thus, if immediately on waking from sleep in the morning the eye be directed to a window for an instant and then closed, an image of the window with its bright panes and darker sashes, the various parts being of the same colour as the object, will remain for an appreciable time."[1]

[1] Foster, *op. cit.*, p. 1265.

§ 11. How the Sensation of Blackness is Conditioned.—It is now held by nearly all psychologists that black is a positive sensation, and not merely the non-existence of visual experience as stillness is an absence of auditory experience.[1] There is, however, no external stimulus to which this sensation can be due. It seems to arise, not, like white and colours, through the action of light on the retina, but rather through the absence of such action. This is possible because the state of any part of the retina or of the cerebro-retinal apparatus is determined not only by external stimulation but by its own previous state and the simultaneous processes going on in other parts. When the eye has become adapted to faint illumination so that only the rods are sensitive, there is no experience of black as distinguished from grey. "Black is only experienced when an area of the retina, previously excited by white light but now unexcited by external stimuli, is in a state other than that of dark-adaptation. Thus, when first we enter an absolutely dark room after quitting daylight, the retina is as yet unadapted to darkness; hence black is experienced. Similarly, when a given area of the retina is unstimulated and the rest of the retina is stimulated by light, that area can never reach a state of complete dark-adaptation; hence, again, black is experienced."[2]

Black, then, though not directly produced by an external stimulus is yet dependent on an excitement of the retina due to contrast.

§ 12. Physiological Theories of Light-Sensation.—Little is known by direct observation and experiment about the physiological processes, either in the retina or

[1] The opposite has, however, been recently maintained by no less an authority than Dr. Ward. See *British Journal of Psychology*, vol. i., p. 407.

[2] Myers, *Experimental Psychology*, pp. 96, 97.

in nervous matter, corresponding to light-sensation. The theories on the subject are hypothetical constructions based on physical and psychological data. The two which are best known are those connected with the names of Helmholtz and of Hering respectively. Neither of these is satisfactory; but they are of great historical importance as yielding the basis from which all subsequent discussion of the problem starts.

The theory of Helmholtz is primarily based on the facts of colour combination regarded from a physical point of view. The aim is to account in the simplest way for the production of the same colour by many different combinations of physical light. Helmholtz believed that this could be done by assuming three, and only three, ultimate physiological processes. Each of these processes takes place in the first instance in the retina and is conveyed by its own special nerves to the brain, where it produces a correspondingly specific nervous excitation. The processes severally correspond to the sensations of a slightly bluish red, a slightly yellowish green, and an ultramarine blue. Their combination in equal proportions yields the sensation of white or grey. Every kind and combination of light excites all three processes. Hence no colour under ordinary conditions of stimulation is ever quite saturated. It always contains a certain intermixture of white. By combining in various proportions the red and the green processes, the green and the blue, the red and the blue, all the colours of the spectrum, together with the purples, may be obtained.

This theory seems a highly satisfactory account of the results of combining lights of different wave-lengths, so long as we do not test it by psychological analysis of the resulting sensations. But when we do this, a difficulty occurs in the case of white and yellow. By mixing green

light with blue light, we obtain a blue-green. This, says Helmholtz, is due to a compounding of the physiological processes corresponding to blue and green respectively. His account of the matter is borne out by a scrutiny of the sensation itself. A blue-green partakes of the nature both of blue and green: it resembles both of them at once. It resembles each in varying degrees according as blue or green preponderates. But by mixing red and green lights we produce, not reddish green, but yellow. The yellow does not partake of the nature both of red and green, as blue-green partakes of the nature both of green and blue. No analytic scrutiny of sensation can discover such a colour as a reddish green. The same is true of white. White, according to Helmholtz, is a compound of all three ultimate physiological processes. But, as a matter of fact, the sensation of white does not partake at once of the three colour-tones, red, green and blue. Now there is no reason why a retinal process set up by a combination of two kinds of stimulus should yield a sensation akin in quality to each of the sensations which the stimuli would separately produce. But it is reasonable to assume that there must be a vital difference in the conditions, retinal or central, when this is so and when it is not so. The theory of Helmholtz leaves no room for such a distinction.

A serious objection to the theory arises from cases of partial colour-blindness. It is evident that, if Helmholtz is right, the absence of one or more of the elementary colour-processes must involve the absence of the sensation of white, which is due to their combination in equal proportions. "A person who is green-blind ought, upon this supposition, to see in white only its red and blue constituents, and hence white ought to look to him as purple looks to us. As long as his defect made him incapable of explaining to us what he felt, this might perfectly well, for

aught we knew, have been the case. But we know now that a person who is green-blind in one eye only sees white with his defective eye exactly the same as he sees it with his normal eye."[1] A similar argument applies also to yellow. The partially colour-blind usually retain the sensations of yellow and blue, although they are without the sensations of red or green or both. There is a marginal zone of the retina at which the sensibility to red and green ceases, and that to yellow and blue is retained. So, with great increase in the intensity of illumination, red and green are still discernible in the spectrum, though yellow and blue disappear. Such facts as these are hard to reconcile with the supposition that yellow is producible only by a combination of the red process and the green process.

If the theory of Helmholtz is unsatisfactory in its account of colour-combination, its failure to explain other facts of light-sensation is still more conspicuous. It accounts for contrast effects between adjoining colours as errors of judgment. A fuller investigation of these phenomena has shown that such an hypothesis is quite untenable. The colour produced by contrast appears and behaves in all respects like the colour produced by direct stimulation. Negative images are explained by Helmholtz as due to fatigue. By long continuance, one or more of the ultimate colour-processes become exhausted, so that the others are predominantly aroused either by stimulation from without, or from the retina's own light. One objection to this view is that, on the principles of Helmholtz, fatigue of all three processes must be constantly taking place, as all three are excited by every kind of light. Now the fatigue which is to explain negative images must take place in the course

[1] C. L. Franklin, "On Theories of Light-Sensation," *Mind*, N.S., vol. ii. (1893), p. 479.

of a few seconds. Hence we should expect a very conspicuous effect of fatigue from the ordinary use of the eyes in daylight. Hardly any capacity for light-sensations of any sort ought to be left at the end of an hour, especially after exposure to predominantly white light, which must exhaust all three processes equally.

In Hering's theory, a strenuous attempt is made to escape the difficulties which beset that of Helmholtz. Following the clue given by psychological analysis of light-sensations, he assumes six ultimate processes, corresponding to the sensations of white, black, red, green, yellow and blue. These he arranges in three antithetic pairs; white and black go together, and similarly red and green, blue and yellow. To each pair there corresponds a separate retinal substance, and a distinct modification of central nervous matter. Each kind of retinal substance is continually undergoing two opposite processes of assimilation and dissimilation. It is continually being broken down and at the same time built up.

The whole theory has reference to the variable relations which these opposite processes in the same substance may bear to each other. They may compensate each other so that there is equilibrium between them. In this case, the red-green and the blue-yellow substances yield no sensation; the black-white substance, on the contrary, yields the sensation of neutral grey which is experienced after prolonged darkness. Any disturbance of equilibrium in any of the substances yields sensation; if change in the direction of assimilation preponderates the resulting experience is of blue or green or white; if change in the direction of dissimilation preponderates the resulting experience is one of yellow or red or black.

It is, further, an essential part of the theory that, when and so far as equilibrium is disturbed, there is a tendency to

its restoration of such a nature that a preponderance of one process of itself excites and maintains the opposite process until equipoise is established between them. Thus if red light acts upon the red-green substance so as to produce a preponderance of dissimilative change with the concomitant sensation of red, an assimilative process is at the same time set up, which in the end leads to equilibrium so that the red light produces no sensation. Thus the eye after prolonged exposure to red light no longer sees red. If now the red light is withdrawn, a negative after-sensation results.

Hering's explanation of this depends on another vital feature of his theory. There is according to him not only a general tendency to equilibrium; there is also an ultimate tendency towards a special kind of equilibrium, that which ensues when the retinal substance is not stimulated by light at all. This he calls *autonomous* equilibrium. Now the balance of opposite processes which exists after the adaptation of the eye to red light is not of this kind. The retinal substance as a result of the action of the stimulus is more disintegrated than in autonomous equilibrium. Hence the return to autonomous equilibrium, on withdrawal of the stimulus, involves a preponderance of assimilative process giving rise to the negative after-sensation.

Hering explains simultaneous contrast as directly due to the influence of process in one part of the retina on process in other parts. Assimilative change in one retinal area tends to set up dissimilative change in adjoining areas; dissimilative change in one area tends to set up assimilative change in adjoining areas.

Neither the theory of Hering nor that of Helmholtz in their original form succeeds in giving a satisfactory explanation of all the important facts of colour-vision. Attempts

have been made to reconstruct them and even to compromise between them so as to remedy their defects. But these later developments are at once too complicated and too insecure to make it worth while to expound them here. One point, however, seems to emerge clearly. The older writers were wrong in considering exclusively processes taking place in the retina. "Evidence is gradually accumulating that before" the physiological change which conditions sensation "reaches its full development, it undergoes a process of complicated elaboration, of the details of which, however, we are as yet totally ignorant. This elaboration doubtless takes place at different stages, at different nervous levels in the cerebro-spinal system, and it is quite conceivable that stimuli which react peripherally on separate neural elements, overlap in their actions on more central elements." "But at present we are powerless" to separate the more peripheral from the more central occurrences; "we can only speak of changes in one vast unravelled complex — the cerebro-retinal apparatus."[1]

[1] Myers, *Text-book*, pp. 99 and 100.

CHAPTER VI.

Sound-Sensation.

§ 1. **Nature of the Stimulus.**—The physical stimulus which occasions sensations of sound consists of vibrations of the particles of the air. As in the case of light, we can distinguish wave-length or rapidity of vibration, amplitude, and complexity. Wave-length determines pitch; amplitude loudness, and complexity timbre.

§ 2. **Organ of Hearing.**—For anatomical details we must again refer to physiological text-books. The drum of the ear is thrown into vibration by impact of sound-waves. This produces movements in certain small bones which vibrate in correspondence with the vibrations of the air, and these movements in their turn give an impulse to a fluid, which by its impact throws into vibration a membrane called the basilar membrane. The vibrations of this membrane are the immediate stimulus exciting certain hair-cells lying on its surface; these sensory cells are directly connected with the fibres of the auditory nerve.

§ 3. **Noises and Musical Sounds.**—Noises as immediate experiences are characterised by confusion and indefinite complexity, and for the most part by irregularity. A musical sound is marked by unity and uniformity of character. "The vibrations which constitute a musical sound are repeated at regular intervals, and thus possess a

marked periodicity or rhythm."[1] Musical sounds are also produced when the periodicity, instead of being regular, varies continuously. Regular vibrations, which would otherwise produce musical sounds, give rise to noises when a large number of them, differing but little in wave-length, occur together, as when a number of adjoining keys of a piano are simultaneously touched. But, in general, the stimulus which gives rise to noises is produced by a series of vibrations differing from one another in period, and also when successive vibrations are too few in number to give rise to a tone. "There is, however, no abrupt line between" noises and musical sounds. "Between a pure and simple musical sound produced by a series of vibrations, each of which has exactly the same period, and a harsh noise in which no consecutive vibrations are alike, there are numerous intermediate stages. Much irregularity may present itself in a series of sounds called music, and in some of the roughest noises the regular repetition of one or more vibrations may be easily recognised."[2]

§ 4. **Pitch.**—"The greater the number of consecutive vibrations which fall upon the ear in a second, the shorter the time of each vibration, the higher is the pitch. Hence the pitch of a sound is determined by the *length* of the wave, a low note having long, a high note short wave-length. We are able to distinguish a whole series of musical sounds of different pitch, from the lowest to the highest audible note."[3] In this series each note has its fixed position between two others which are barely distinguishable from it; the one being somewhat higher, and the other somewhat lower. The arrangement is therefore linear, and comparable to the series of greys intervening

[1] Foster, *Text-book of Physiology*, book iii., chap. iv., p. 1361.
[2] *Ibid.* [3] *Op. cit.*, p. 1362.

between white and black. It has been maintained that, as in the greys we can distinguish varying degrees of affinity to white and black respectively, so in the scale of notes of different pitch, two ultimate modes of sensation are involved, corresponding to black and white.[1] But this view has not been generally accepted.

Vibrations having a recurrence below from fifteen to twenty per second fail to produce a sensation of sound. There is a similar limit for high notes. This upper limit is about 22,000 vibrations per second. In music, only a comparatively small portion of these tones are used, beginning with about 22·6 and ending with about 4096 vibrations a second.

The power of distinguishing difference of pitch is very highly developed within a certain range. In tones rising from 100 to 1000 vibrations in a second, practised observers under favourable conditions can discriminate differences of pitch corresponding to differences of one quarter or one fifth of a wave-length. Tones above 4000 or below forty are distinguished from each other with much less accuracy. Towards the higher end of the scale, differences of hundreds or even of thousands of vibrations a second may not be recognisable.

§ 5. **Harmonic Intervals.**—When, of two notes simultaneously produced, the vibration period of one is exactly twice as rapid as that of the other, the two sensations show a strong tendency to blend into one. It is hard to distinguish them as two. The result of their union is a richer and fuller sensation, peculiarly agreeable to the ear. There is also a tendency to confuse the two sensations even when they do not occur simultaneously. When even a practised musician is called upon to imitate upon the

[1] See Mach, *Analysis of the Sensations* (English trans.), pp. 127, 128.

piano a tune whistled by the mouth, he frequently produces the tone which corresponds to half or double the number of vibrations per second, or, in other words, the upper or lower octave of the note which he has to imitate. What is peculiarly interesting is that the tendency to confuse a note with its octave in memory, and to hear them as a single musical sound when they are simultaneously produced, does not depend on similarity in pitch. Notes much nearer in pitch are easily and clearly distinguished. What has been said of the octave holds also of other musical intervals, the double octave, the fifth, and the twelfth.

§ 6. **Combination of Musical Sounds from Different Sources.**—When musical sounds occur together, it usually requires attention to discriminate them. It is, as we have seen, peculiarly difficult to do so when the one is the octave, the fifth, or the twelfth of the other. The greater the relative intensity of one of the notes as compared with the others, the more easy it is to discern it as a separate tone. It is harder to distinguish in proportion to its relative faintness. The combination of tones yields a specific experience, which cannot be regarded as merely the sum of the separate experiences of the separate notes. Even when the constituent tones are discriminated, they are still apprehended as integral parts of a whole. This whole has its own characteristic pitch and its own characteristic intensity.

§ 7. **Beats and Dissonance.**—"If two tuning-forks" sounded together "are not of the same pitch, but so related that the period of vibration of the one is not an exact multiple of that of the other, the sensation which we experience has certain marked features. We hear a sound which is the effect on our ear of the compound wave formed out of the two waves; but the sound is not uniform

in intensity. As we listen the sound is heard now to grow louder and then to grow fainter or even to die away, but soon to revive again, and once more to fall away, thus rising and falling at regular intervals, the rhythmic change being either from sound to actual silence or from a louder sound to a fainter one. Such variations of intensity are due to the fact that, owing to the difference of pitch, the vibratory impulses of the two sounds do not exactly correspond in time. Since the vibration period, the time during which a particle is making an excursion, moving a certain distance in one direction and then returning, is shorter in one sound than in the other, it is obvious that the vibrations belonging to one sound will, so to speak, get ahead of those belonging to the other: hence a time will come when, while the impulse of one sound is tending to drive a particle in one direction, say forwards, the impulse of the other sound is tending to drive the same particle in the other direction, *i.e.* backwards. The result is that the particle will not move, or will not move so much as if it were subject to one impulse only, still less to both impulses acting in the same direction; the vibrations of the particle will be stopped or lessened, and the sensation of sound to which its vibrations are giving rise will be wanting or diminished: the one sound has more or less completely neutralised or 'interfered' with the other, the crest of the wave of one sonnd has more or less coincided with the trough of the wave of the other sound. Conversely, at another time, the two impulses will be acting in the same direction on the same particle, the movements of the particle will be intensified, and the sound will be augmented. And the one condition will pass gradually into the other. The repetitions of increased intensity thus brought about are spoken of as *beats.*"[1]

[1] *Op. cit.*, pp. 1367, 1368.

Beats are separately discernible when the difference between the vibration frequency of the concurrent tones is very small. As the difference becomes greater, the beats occur more rapidly, and are not so clearly discernible. They then give rise first to a thrusting or stabbing and then to a rattling or whirring effect. This ceases as the frequency of the beats increases. But even then the beats still manifest their presence by imparting to the sound a certain roughness. This experience may persist even when there are hundreds of beats in the second. When the beats occur with sufficient rapidity, the roughness or harshness ceases. Before this point is reached, the sound, because of the harsh effect of the beats, is said to be *dissonant*.[1] The number of beats produced by two notes which approach each other in vibration frequency is equal to the mathematical difference between the number of vibrations per second of each. "Thus two . . . tuning-forks vibrating respectively at sixty-four or seventy-two a second, will give eight beats a second,"[2] because the shorter wave overtakes the longer eight times, so as to give to the vibrating particles opposite impulses, which neutralise each other. We have seen that as the interval between the combined tones becomes increased, the beats become so rapid that they are no longer appreciable; but they recur again when the interval is sufficiently increased. They recur when the interval is somewhat greater or less than the octave, and again when it is somewhat greater or less than the twelfth, the double octave, etc. Two tones of 200 and 396 vibrations in a second give four beats; four beats are also produced by tones of 200 and 404 vibrations in a second.

[1] This may not be the only condition of dissonance. Whether it is or not is disputed.

[2] *Ibid.*

The number of beats is equal to the difference between the vibration number of the higher tone and that multiple of the vibration number of the lower tone which comes nearest to the vibration number of the higher tone. Thus if the notes are 200 and 596 the number of beats is $3 \times 200 - 596 = 4$. This explains why a small deviation from the octave or other musical interval produces a dissonant effect.

§ 8. **Timbre.**—The same note sounded on a piano, a violin, a trumpet, etc., has a very varying character, though its pitch is identified as the same. Differences of this kind are called differences of *timbre*. *Timbre* is due to the complexity of the sensation. Ordinary musical sounds, even when they arise from a single source, are not simple. Attentive analysis can discern a number of distinct partial tones. The power of discrimination varies with musical aptitude and practice in analysis. The pitch of the whole complex is approximately the pitch of the lowest tone. This is called the *fundamental tone* and is of course identified at the outset. The *overtones*, as they are called, are separated from the fundamental tone by harmonic intervals. The most intense of them are usually those which have most affinity with the fundamental tones, such as the octave. Thus, though their relative intensity makes it easier to discriminate them, their harmonic relation makes it more difficult. With sufficient practice, a person of natural musical aptitude acquires great power of discriminating overtones. The less skilled may use artificial helps. Thus the partial tone may be first sounded separately on a tuning-fork, and then kept in mind in attending to the note which is to be analysed. Several tones in succession may be tried in this way; some of them may be discernible as constituent overtones and others not.

A moderate number of relatively low partial tones

makes the whole richer and fuller and somewhat higher in pitch. A large number of high overtones of considerable intensity gives to the whole a sharp and penetrating and sometimes a somewhat harsh character. The harshness arises from beats between the high overtones.

The combination of partial tones in a complex note produced from a single source is analogous to the combination of notes from different sources, except as regards the great difference in intensity between the fundamental tones and the overtones. The whole experience due to the combination is specific in its character, and is not a mere summation of the experiences severally due to the partial tones. This is true even when the partial tones are discriminated. They are still apprehended as constituents of a whole having an unique character. Analytic attention in discovering overtones does not appear to create them in the moment of discovery, but to find what is already preexisting. Thus the composition of an ordinary musical note affords an excellent example of sensations which are merely felt without discrimination of their distinctive qualities. So long and so far as the experience is unanalysed, the constituent sensations are present, *qua* sensations, though their presence is not cognised. There is a sense-differentiation without perceptual distinction.

§ 9. **General Theory of Sound-Sensation.**—Anatomical research seems to indicate that the immediate stimulus to the terminations of the auditory nerve is constituted by the vibrations of the basilar membrane. The main clue to the way in which this membrane acts is found in physical and psychological data. On the physical side, we have the broad fact that impulses which would separately give rise to distinct waves of sound, blend their action, before they reach the ear, into a single resultant effect. They produce a single wave, the form of

which is mathematically accounted for by their combination. This is true whether the several impulses come from separate material objects or from the same object. Thus the vibrations which produce ordinary sounds are complex in their mode of origin. The forms which they consequently assume can be mathematically resolved into a combination of the forms of certain constituent simple waves. These simple waves are called *pendular*, because their form is like that described by the sweep of a pendulum. Though one, not many waves, is produced by the impulses which simultaneously set the air in vibration, yet each of these impulses acts separately on the organ of hearing. This is known to be so because the several sensations corresponding to each are distinguishable in consciousness. We can analyse a single note into its partial tones, and we can distinguish a number of notes sounded simultaneously from different sources. This is the starting-point for the theory of sound-sensations. The organ of hearing must be so constructed as to respond separately to the several impulses which produce the complex wave.

The most satisfactory way of accounting for this analytic power of the ear is that propounded by Helmholtz, and now commonly, though not universally, accepted. It proceeds on the analogy of certain physical phenomena. If a tuning-fork, which produces a simple tone without overtones, be laid on the top of a piano, and if the corresponding note is sounded by touching one of the keys, the tuning-fork vibrates in sympathy with it. If the lower octave of the note be sounded, the tuning-fork again vibrates in sympathy; for its own note, being an octave of the note sounded on the piano, is contained in this as one of its overtones. It can be similarly made to vibrate in sympathy with any of the notes which contain its own note as an overtone. It is unaffected by other notes.

Conversely, if the tuning-fork is struck in the neighbourhood of the wires of a piano, those wires will vibrate in response to it which are specially adjusted to the same tone, or to any of the notes which contain this as an overtone. In the second case they do not vibrate along their whole length, but in segments. The wire which corresponds to the lower octave of the tone sounded on the tuning-fork responds by a vibration of which the wavelength is half the length of the wire. Now, the theory of Helmholtz is that the basilar membrane consists of a series of strands, each of which, like the wires of a piano or like a tuning-fork, is adapted to its own peculiar tone, and vibrates in response to this. Thus, however complex the physical sound-wave may be, it produces in the basilar membrane not a single complex vibration, but a number of distinct vibrations, and each of these constitutes a separate stimulus affecting the terminations of the auditory nerve.

The theory of Helmholtz is supported by facts analogous to colour-blindness; there are cases in which the mechanism for conducting sound-impulses is intact, and yet the sensibility for greater or smaller portions of the scale of tones is absent or much impaired. In some instances the tone-deafness extends to the greater part of the scale, leaving sensibility only to a fragmentary portion of it. One tone of moderate intensity may be clearly distinguished, while another neighbouring tone is indistinguishable, even when it is very loud. It is difficult to explain these phenomena unless we suppose in the ear a system of separate elements, each adjusted to its own peculiar tone, some of which may be absent or incapable of discharging their function while the rest behave in a normal manner. The view of Helmholtz accounts for the possibility of this by assuming that certain basilar fibres may cease to vibrate properly while others remain efficient.

CHAPTER VII.

THE WEBER-FECHNER LAW.

§ 1. **The Experimental Facts.**—We can compare any two objects and pronounce them like or unlike. If the objects are disparate in kind, we are unable to say more than that they are unlike. This is the only result of comparing the brightness of the sun with the immortality of the soul. If we compare the brightness of a light with the loudness of a sound, we can say that both possess intensity; but we cannot fix any definite relation between them. For instance, we cannot affirm that the loudness of the sound is equal to the brightness of the light. On the other hand, if we compare the quantitative variations of the same kind of object in the same respect, we can pronounce more definite judgments. We can, for example, pronounce that one sound is less or more loud or equal in loudness to another. Besides this, we can compare degrees of unlikeness with definite results. We can say that one sound, C, is as much louder than B as B is louder than A. In this way we can select two sounds of different loudness, and then proceed to find a third exactly intermediate between them. We may then compare the intermediate sound, B, with each of the extremes, A and C, so as to interpose between A and B a D, unlike in loudness to A in the same degree in which it is unlike in loudness to B; and to interpose between B and C an E unlike in loudness to B in the same degree in which it is unlike in loudness to C.

It is thus possible to form a scale passing by equal gradations of unlikeness from a very faint sound to a very loud one. Similar scales can be formed for degrees of unlikeness in pitch, in the brightness of light, in weight as appreciated by pressure on the skin or by lifting, etc.

Now the fundamental fact which underlies Weber's law is that equal degrees of unlikeness in sensation do not correspond to equal increase or decrease in the absolute intensity of the stimulus. If a series of increasing intensities of stimulation be denoted by R_1, R_2, R_3, R_4, and the corresponding sensations by r_1, r_2, r_3, r_4, the degree of unlikeness between r_1 and r_2 is equal to the degree of unlikeness between r_3 and r_4, when $\frac{R_1}{R_2} = \frac{R_3}{R_4}$, or to use an equivalent formula, in some respects more convenient, when $\frac{R_2 - R_1}{R_1} = \frac{R_4 - R_3}{R_3}$. Long before quantitative methods in psychology were thought of, astronomers had occasion to classify the stars according to their relative brightness. The different classes are arranged in a scale. At the top of the scale comes the brightest; the unlikeness in average brightness between this and the second class is equal to the unlikeness in average brightness between the second and third class, and so on. The corresponding intensities of the physical lights have since been determined; and it is found that they approximately form the geometrical series, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, etc. Here each stimulus is the half of the preceding stimulus. Obviously $\frac{1}{2} : \frac{1}{4} :: \frac{1}{4} : \frac{1}{8}$, and $\frac{1}{4} : \frac{1}{8} :: \frac{1}{8} : \frac{1}{16}$; and $\frac{1}{2} : \frac{1}{4} :: \frac{1}{8} : \frac{1}{16}$.

In experimental investigations, attention has been chiefly given to degrees of unlikeness which are just perceptible. The original stimulus, whatever its absolute intensity may be, must be increased by a certain constant fraction of its own amount, before any unlikeness in the sensation is

discernible. The constant fraction is different for different kinds of sensation. In estimating weight by lifting with the hand, the ratio between original stimulus and increased stimulus must be about 29 : 30 before an unlikeness is perceptible; or to use technical language, before the *difference-threshold* is passed.

Difference-threshold is in one respect a misleading term: the facts do not warrant us in saying that there is no difference in the sensation before the threshold is passed, but only that there is no *discernible* difference in the sensation. It would be more accurate to speak of the threshold of *discernment* than of the threshold of difference. For brightness of white light, unlikeness only becomes discernible when the ratio of the original stimulus to the increased stimulus is 100 : 101, or, in other words, when the increment is $\frac{1}{100}$th of the original stimulus. "If we place two candles so as to throw two shadows of some object on a white surface, the shadow caused by each light will be illuminated by the other light, and the rest of the surface will be illuminated by both lights. If now we move one candle away we shall reach a point at which the shadow caused by it ceases to be visible, that is to say, we fail at this point to appreciate the difference between the surface illuminated by the near light alone and that illuminated by the near light and the far light together. If now, having noted the distance to which the candle had to be moved, we repeat the same experiment with two bright lamps, moving one lamp away until the shadow it casts ceases to be visible, we shall find that the lamp has to be moved just as far as the candle; that is to say, the least difference between the illumination of the bright lamps which we can appreciate is" in the same proportion "as in the case of the dimmer candles. Many similar examples might be given showing a similar result; in fact, it is

found by careful observation that, within tolerably wide limits, the smallest difference of light which we can appreciate by visual sensations is a constant fraction (about $\frac{1}{100}$th) of the total luminosity employed." [1]

It should be added that a stimulus must reach a certain degree of intensity before it can produce any discernible sensation at all. Physical light or physical sound may be too faint to be distinguishable. The point at which it is just indistinguishable, so that the least increase would make it distinguishable, is called the *stimulus-threshold.*

§ 2. **Interpretation.**—The explanation of the facts described has been much discussed. On one view, there is no difference of sensation at all where there is no discernible difference. On this assumption, increase in the intensity of the stimulus fails to produce an increase in the intensity of the sensation itself until the increment is a certain fraction of the original stimulus. This position seems incompatible with the fact that a sensation A may be indistinguishable from B, and B from C, and yet A may be distinguishable from C. If discernible unlikeness in sensation were co-extensive with actual unlikeness, this would be impossible.

If we have a series of stimuli, a, $a+h$, $a+2h$, $a+3h$, etc., we obtain a distinguishable difference of sensation only when a is increased by a certain fraction of its original amount, let us say by $\frac{1}{4}$. A difference is discernible only when we reach $a+\frac{1}{4}a$. Suppose now that we start, not with a, but with $a+2h$, successive increments to this yield a distinguishable difference only when we come, not to $a+\frac{1}{4}a$, but to $a+2h+\frac{1}{4}(a+2h)$. It follows that the increments which do not produce any discernible difference must produce indiscernible or sub-conscious differences. Suppose

[1] Foster, *op. cit.*, p. 1211.

two sensations, s_1 and s_2, which are not distinguishable from each other, although the stimulus S_1 which produces s_1 is greater than S_2 which produces s_2; if we say that because there is no discernible difference in the sensation there is no difference in it at all, we get an absurd result. For by further increasing the stimulus we obtain a sensation s_3 which is distinguishable from s_1, but not from s_2. Now if there is no difference between s_1 and s_2, and again no difference between s_2 and s_3, there can be no difference and, *a fortiori*, no distinguishable difference between s_1 and s_3. It is futile to suggest that increase in the stimulus may be attended by increase in nervous excitement without concomitant difference of sensation. For if increased nervous excitement yields no difference between s_1 and s_2, and none between s_2 and s_3, it can produce none between s_1 and s_3. If s_1 is identical with s_2 and s_2 with s_3, s_1 must be identical with s_3. If we add to the burden on a man's back straw by straw, he will, when sufficient straws are added, become sensibly aware that the weight has increased as compared with some previous stage of the process. But at no point will he discern a difference between the weight he was previously carrying and the same weight as increased only by a single straw. Hence the successive straws must produce indiscernible differences, in order to account, by by their accumulation, for the difference which is ultimately noticed.

In Fechner's explanation of the law this point is recognised. He rightly holds that the sensation varies with the stimulus even when the variation is not perceptible. It becomes perceptible when the degree of variation has passed a certain limit. So far, we may follow him. But he also holds that the increase in intensity of sensation required to constitute a discernible unlikeness is not relative but absolute, so that the variations of stimulus

form a geometrical series, while the corresponding variations of the sensation form an arithmetical series. In estimating weight by means of passive pressure, if we begin with an ounce, we must add a third of an ounce before any unlikeness is discernible; if we begin with a pound, we must add a third of a pound before any unlikeness is discernible. In both cases, according to Fechner, the increase in the intensity of the pressure-sensations is not relatively the same but absolutely the same. There are serious objections to this view. There is a difficulty in testing it, because of the peculiar nature of intensive magnitude. Intensive magnitude is indivisible. We cannot subtract a fainter sound from a louder so as to be able to point to a certain degree of loudness as the mathematical remainder. Hence we cannot in such cases immediately test Fechner's contention that the degree of unlikeness between two sensations is simply proportional to their mathematical difference—to the remainder which would be left if one could be subtracted from the other.

But there are other cases of the application of Weber's law in which this difficulty does not present itself. Weber's law holds good of extensive as well as intensive magnitude, and it also holds good of number. If we compare a line two inches long with a line three inches long, and then compare a line six inches long with a line seven inches long, according to Fechner the degree of unlikeness between the two inch line and the three inch line ought to be identical with the degree of unlikeness between the six inch line and the seven inch line. In both cases the absolute or arithmetical difference is the same—one inch. This is true from the psychological as well as from the physical point of view. For if we suppose the lines to be presented to the eye under similar conditions, the mode

in which an inch affects the retina in the one case may be virtually identical with the mode in which it affects the retina in the other case. The inches are not only equal as measured by a rule; their visual appearances are also approximately equal in extensity. We are therefore dealing with psychical, and not merely with physical, magnitudes. But in spite of the fact that $3-2=1$, and that $7-6$ also $=1$, there is a greater degree of unlikeness between the line of two inches taken as a whole, and that of three inches taken as a whole, than there is between the line of six and that of seven inches.

The same holds for least perceptible degrees of unlikeness. If we have to increase the length of a line of six inches by a certain amount in order that the unlikeness may be just discernible, we must increase the length of a line of two inches, not by the same amount, but in the same proportion, in order that the unlikeness may be just discernible. Number as well as extension affords illustration. If we lay a group of three counters on the table beside a group of two, and if we then lay a group of eight beside a group of seven, it is clear that there is a greater resemblance between the group of eight and the group of seven than there is between the group of three and the group of two. Yet in both cases the absolute difference is the same—one counter.

The principle holds also for magnitudes which are not directly perceived, but thought of. Everybody recognises that a billion and one is more like a billion than eleven is like ten. So in the ordinary dealings of life, if we have to pay or receive sums amounting to hundreds of pounds, we feel that it does not matter about odd pence; but a penny more or less is by no means negligible if the sum to be paid or received is under a shilling.

We may then conclude that degree of unlikeness between

extensive quantities is neither identical with their absolute difference nor proportioned to it.

In the case of intensive magnitudes, such as the loudness of a sound, or the brightness of a light, there is, properly speaking, no arithmetical difference, because we cannot divide such magnitudes into parts, so as to find a numerical equivalent for each, and subtract the one from the other. None the less, there may be in intensive magnitude something analogous to the arithmetical difference. The velocity of a moving body is an intensive magnitude; but it is a magnitude which can be represented by a number which is a function of the space traversed and the time which it takes to traverse it. It may thus be treated as if it were an extensive magnitude capable of addition and subtraction. There is no reason why the intensity of sensation should not be conceived in the same way. At any rate, the mere fact that we are dealing with intensive magnitude does not in itself constitute an insuperable objection to the abstract possibility of such a mode of treatment. Hence there is in principle no objection to Fechner's attempt to correlate increased intensity of sensation with increased intensity of stimulus. But he was over-hasty in supposing that equal degrees of unlikeness involved equal absolute differences of quantity in the sensation. On the contrary, the analogy of extensive magnitude seems to show that degree of unlikeness is correlated with relative, not absolute, differences in intensity of sensation. Fechner's problem is yet to be solved. We do not yet know the law which connects increase in the strength of the stimulus with corresponding increments of sensation. We cannot yet assign a number which shall represent degrees of loudness or brightness, as the number obtained by dividing the sum of units of time into the sum of units of space represents velocity.

§ 3. **Further Questions.**—Here a question of some importance arises. It is often assumed without discussion that all least perceptible degrees of unlikeness between the same kinds of sensible qualities are equal. Now this is by no means self-evident. It is indeed not self-evident that degrees of unlikeness which are just discernible, are therefore equally discernible, that is to say, discernible with equal ease. Even if they are all discernible with equal ease, it does not follow that they are themselves equal. The appeal in the last instance must be to actual comparison. A valid reason for assuming them to be equal is that they appear equal. Another reason is that they occur under the conditions of Weber's law, which holds in general for equal degrees of unlikeness.

A stimulus must reach a certain degree of intensity before it can produce any discernible sensation at all. The question arises whether it produces any sensation before it produces a discernible sensation. Proceeding on the general analogy of the results we have reached in discussing Weber's law we must assume that in all probability it does. We have here a special case of the general relation of stimulus to sensation. Within limits, the sensation varies as the stimulus is increased, without the variation becoming perceptible. It is most natural to bring the case of a stimulus, which is not yet intense enough to produce a discernible sensation at all, under the same principle. It is still more improbable that sensations which escape notice merely because our attention is otherwise occupied have no existence as psychical facts. Thus, from our present point of view, we can confirm the doctrine of sub-conscious sensations.

§ 4. **Limitations of Weber's Law.**—We have spoken of Weber's law as if it held good exactly and uniformly for all sensations; but as a matter of fact this is far from

being the case. Many deviations and limitations have been discovered by experiment. Verification commonly fails for very high or very low intensities of sensation. In view of the complexity of the operative conditions this is not in the least surprising. We might suppose the law to be perfectly exact, inasmuch as it states that unlikeness between sensations depends upon their relative difference, without supposing that this relative difference is determined only by difference of external stimulation. The special structure of the different sense-organs is probably an important factor. To speak of nothing else, the eye and the ear have sensations of their own due to internal stimulation, which it is difficult to allow for.[1]

[1] The treatment of Weber's law in this chapter follows Meinong, *Ueber die Bedeutung des Weberschen Gesetzes*, etc.

CHAPTER VIII.

The Affective Tone of Sensation.

§ 1. **Common Sensibility.**—The pleasure and pain connected with organic sensations are of fundamental and all-pervading importance in our mental life. Normally, these sensations are fused in a total mass of experience, which can only be very partially analysed into its components by attentive scrutiny. The membranes which line our internal organs are generally supplied by sensory nerves, which, from all parts of the body, are perpetually conducting a multitude of impressions to the central nervous system. On the resultant effect of these impulses, and on direct affection of the nervous system by organic conditions, it depends whether at any moment we feel well or ill, cross or complacent. By the nature of our organic sensations in the morning we can often predict whether the day's experiences are going to be agreeable or disagreeable. The feeling-tone of common sensibility determines in large measure the feeling-tone of more special experiences in the way of sensations, perceptions, and ideas. An incident which might be pleasant or but slightly disagreeable if we were feeling fresh and "fit," is apt to be intensely disagreeable if our organic functions are out of order. This is too well-known a fact to need extended illustration. Smells and tastes which are agreeable to the healthy person may be highly unpleasant to the invalid. After a full meal, food which was previously delicious may become almost nauseous · even

the idea of it may be unpleasant. The very thought of smoking a pipe in certain states of body may be repellent in the case of persons who usually enjoy the use of tobacco. The profound alteration of organic conditions which accompanies pregnancy produces curious "longings" and repugnances for articles of food. It thus appears that organic conditions directly or indirectly influence the whole state of the central nervous system.[1] The neural processes connected with special sensations are more definitely restricted and localised. The experiences due to common sensibility are diffusive in their character. They give to the nervous system a certain general predisposition, and on the psychical side produce a certain general mood or temper.

By reflective scrutiny it is possible, as we have said, to detect special components of the total complex of organic sensation, such as those due to the heart-beat, and respiration, and the shiverings of cold or glows of warmth arising from contraction or dilatation of the blood-vessels at the surface of the body. But there are occasions when no special effort of attention is required to detect an organic sensation. The experiences immediately due to a toothache, to a colic, to muscular cramp, to a burn, a bruise, or a blow, usually compel attention, whatever other interests may compete with them. When one organic sensation detaches itself from the mass of common sensibility, it is apt to be overwhelmingly obtrusive. Such intense experiences

[1] Besides receiving sensory impressions from the internal organs, the central nervous system is also directly affected by general organic conditions, and in particular by the character and amount of the blood-supply which flows to it. This factor must also contribute to determine the general nature of experience as pleasant or unpleasant. Its relative importance as compared with the more indirect effect of sensory impressions upon the internal organs is difficult to estimate.

are much more often painful than pleasant; but they also occur in agreeable phases. In general, the satisfaction of organic cravings, such as hunger and thirst, may be intensely agreeable. The peculiarly disagreeable character of most organic sensations which are intense enough to detach themselves from the general mass, is marked by the usage of popular language which applies to them in a restricted and distinctive sense the word *pains*. A bitter taste or a discord may be disagreeable, but it is not usually called a pain. On the other hand, we currently speak of the pains of hunger, of scalding or burning, or of toothache. The reason is that the main importance of such experiences lies in their affective tone. They have comparatively little value for cognitive consciousness. They contribute comparatively little to the discrimination of the qualities of external bodies; and they yield only more or less vague information about the condition of our own bodies. When we have received a wound, we have to look at it to find out its precise character, and the proper mode of treating it. The pain-sensation itself does not yield definite knowledge.

It must be noted that those sensations which are in popular language called, by a distinctive application of the word, *pains*, have other characteristics besides their mere unpleasantness. The affective tone does not exist in abstract purity: it is always the affective tone of some sensation having a more or less determinate character of its own. It is through the character of the accompanying sensation that we are able to distinguish different kinds of organic pain or pleasure. Thus we discriminate from each other stinging, piercing, gnawing, crushing, beating, shooting, burning, and innumerable other kinds of pain. Hence it is possible to compare pain-sensations in other respects than the

intensity of their painfulness. The points of agreement and difference are to a large extent to be found in the temporal and local distribution of the constituents of a complex experience. Local distribution is marked by such terms as *pricking*, *shooting*. Temporal sequence and rhythmic alternation are marked by such terms as *throbbing*, *beating*, and the like. These differentiating qualities which we use in describing the varieties of pain-sensation have usually little cognitive value of any other kind. So far as cognitive consciousness is concerned, their main function is fulfilled in enabling us to detect and express the difference between one kind of pain and another. It is therefore natural that in naming them we should apply to all indifferently the common word *pain*. But it is better to speak of *pain-sensations* than of *pains*, in order to indicate that something besides mere unpleasantness is involved. Markedly analogous experiences may also occur without any intensely disagreeable feeling-tone. A slight burn may retain much of the peculiar prickly, pungent quality of the original sensation when the painfulness has almost or quite disappeared. So it is possible occasionally to detect the peculiar throb characteristic of a toothache, and the tenderness of the gum, when the acutely disagreeable phase of the experience has passed away or has not yet arrived. Hunger is usually unpleasant, but sometimes the beginning of it does not appear to be so.

So far we have referred only to those distinctive features which serve us in *describing* the difference between one pain-sensation and another. But there are undoubtedly other differences which seem incapable of analysis and description. This follows from the diffusive nature of organic sensations. The particular sensation which we regard as painful may have its origin in a burn or a wound in a particular part of the skin, or in a diseased

condition of the membrane of the stomach or bowels. The specific nature of the experience will therefore be in part determined by the character of this primary sensation. But the disturbance set up by the localised impression tends to involve more or less the whole nervous system, and to overflow the whole organism. The diffused effect on the nervous system may be marked by some peculiarity in the experience. Certainly, the impressions which arise from the changed conditions of the organism as a whole must modify the total experience in an important degree. But these elements are not easily expressed in definite language. They can, as people say, be felt but not described.

Organic pains and pleasures in extreme degrees of intensity reduce to a minimum cognitive process in general. In having a tooth drawn, our consciousness seems to consist in a single thrill of mere sensation. Attention to defenite objects ceases: we cannot be said to attend even to the sensation itself, except in the vaguest way. We do not take note of its peculiar qualities, we simply feel it. The distinction between subject and object is for the moment more or less obscured. It remains true that the experience has a peculiar quality which might be analysed and described by a demon which had taken possession of us and was watching our mental processes. But no approach to such analysis and description is possible to us until the experience is over, and we can calmly regard it in retrospect.

§ 2. **The Special Sensations.**—We now turn to consider the special sensations of sight, sound, smell, taste, touch, and temperature. The affective tone of these sensations varies, first, with their intensity, secondly, with their duration, and thirdly, with their quality.

(1) Many of them in a low grade of intensity appear to

be virtually neutral. All of them acquire appreciable affective value as their intensity becomes increased. Some of them are unpleasant even when they are weak. All of them become unpleasant when intensified beyond a certain point. Before reaching this point they nearly all have an agreeable phase; after reaching this point they continue to be more and more disagreeable as intensity increases. It is a matter of dispute whether there is any sensation which is constantly disagreeable in whatever phase of intensity it appears. It is always possible to urge that though a sensation is generally disagreeable, it might be agreeable if it could be made weak enough.

As an example of a pleasant phase of an experience which everybody would regard as absolutely disagreeable from its very quality, we may quote the following from Mr. H. R. Marshall: "I remember well once having been aroused from serious thought in a railway carriage by a delicious odour, and the words 'What a delightful perfume!' were actually formed in thought. Almost immediately the smell changed to disagreeableness with growing intensity, and there appeared evident the intensely disagreeable smell emitted by a polecat which had been killed by the train."[1]

We may formulate the general rule for the relation of intensity and affective tone as follows. A sensation must reach a certain minimum of intensity in order to have an appreciable feeling-tone. Further rise in intensity of sensation is accompanied by a rise in intensity of feeling-tone. If the sensation is initially unpleasant, its unpleasantness continues to increase as the sensation is intensified. If it is initially pleasant, the pleasantness increases to a certain maximum, at which it remains

[1] *Pain, Pleasure, and Aesthetics*, p. 288.

roughly constant until the intensity of the sensation is increased beyond a certain limit. When this limit is passed, the pleasantness decreases, and finally passes into unpleasantness.[1]

The nature of the transition from pleasantness to unpleasantness requires further elucidation. An unpleasant element appears to enter into the experience even while the original sensation continues to be in itself agreeable. This is sometimes distinctly traceable to other definitely assignable sensations, which are superadded to the primary one. Thus, at a certain pitch of intensity, warmth may continue to be still agreeable in itself, although it is accompanied by a distinctly disagreeable sensation of a prickly or pungent character, probably due to stimulation of heat-spots as distinguished from warmth-spots in the part of the skin affected. So a bright light may continue to give pleasure when it is so intense that the effort to accommodate the eye to it is unpleasant. But there are other cases in which it is much more difficult to assign definitely the source of the collateral unpleasantness. However intense sweetness may be, it scarcely seems to become in its own intrinsic nature disagreeable. At the same time, it may excite strong disgust, which seems to be connected with accompanying organic sensations not easy to analyse or describe.

(2) The dependence of feeling-tone on duration varies in nature according as the sensation is continuously maintained or repeated intermittently.

The following is the general formula for variations of feeling-tone with the continuous persistence of the sensation in time. The feeling-tone increases in intensity to a

[1] See A. Lehmann, *Die Hauptgesetze des menschlichen Gefühlslebens*, p. 181.

maximum. If the sensation is pleasant, it continues for some time at this maximum, and then gradually becomes less agreeable, and in the end distinctly disagreeable. If the sensation is initially unpleasant, the maximum persists for a much longer period than in the case of agreeable sensations. After this, the unpleasantness may become fainter, but it never passes into pleasantness, and it is always liable to reappear at intervals in more intense phases.

The same remarks which we made about the transition from pleasantness to unpleasantness with rise in intensity apply to the same transition as dependent on continuous persistence in time. Here also collateral elements of a disagreeable kind are introduced into the experience before the primary sensation becomes in itself unpleasant. The illustrations of the bright colour and of the sweet taste may be transferred, *mutatis mutandis*, to the case of duration. A boy eating sugar-plums, if he continues to indulge himself beyond a certain point, has disagreeable sensations distinctly traceable to the stomach and other internal organs, while the sweetness itself remains sufficiently agreeable to tempt him to go on eating. But even apart from such definitely assignable collateral accompaniments, there may be a surfeit of sweetness, though sweetness remains in itself an agreeable taste. Doubtless this is due to some general organic effect hard to define by introspective analysis. Sometimes the disagreeableness is simply due to tedium; if we gaze at a bright colour too long we feel bored because of the suspension of other activities, although the colour continues to be pleasing.

The case in which the sensation is repeated intermittently is in many ways analogous to that in which it persists continuously. If the repetition is too frequent,

a pleasant sensation tends to become less pleasant, and often becomes unpleasant. Unpleasant sensations by frequent repetition often, but by no means always, become less unpleasant. They may even become virtually neutral or even actually pleasant. Perhaps the best instance of a disagreeable sensation becoming agreeable by repetition is the "acquired taste" for olives.

When a pleasant sensation by repetition does not lose its pleasantness and become disgusting, and when an initially unpleasant sensation has become more or less pleasant by repetition, its absence from consciousness will at certain moments give rise to a craving for it. The craving of the smoker for tobacco, of the olive-eater for olives, or of the drinker for his bitter beer, are cases in point. The effect is especially noticeable when originally unpleasant sensations have become pleasant by repetition. The nervous system has adapted itself to certain modes of excitation returning at certain intervals, and their absence produces a disturbance of neural equilibrium. If a person is in the habit of using tobacco only at fixed times in the day, the craving is apt to arise exclusively at these times. The omission of a customary early morning pipe may trouble the smoker in the early morning, but the craving may pass away and not recur during the day.

(3) We have seen that there are probably some sensations which are disagreeable in all phases of intensity. Others become disagreeable at a very low intensity. In the case of others, such as sweetness, it is not quite certain that they ever become intrinsically disagreeable, even when they are most intense. It follows that quality of sensation is a most important factor in determining affective tone. We can do little to explain in detail why one quality as such is predominantly agreeable and another predominantly

disagreeable. The nearest approach to an explanation is found in the special case of certain complex sensations. The disagreeableness of dissonance is due to the presence of beats which interrupt the uniform course of the periodic stimulation of the organ of hearing. The attention has adapted itself to a certain rhythm of excitation, and this rhythm is disturbed by the beats. The disagreeableness of a flickering light may be similarly accounted for. We have no similar reasons to assign why certain combinations of odours and tastes are agreeable, and others disagreeable.

§ 3. **Surplus Excitation.**—It is clear that the agreeable or disagreeable feeling arising in connexion with the occurrence of a sensation may not be wholly due to the quality or intensity of the sensation itself. "If one is listening to a series of sounds, or looking intently at some object, the feeling of 'distraction' caused by being spoken to in a whisper, or lightly touched," is comparable with sharp physical pain.[1] The whisper or the light touch may be in no way disagreeable in themselves; they may be virtually neutral; but they set up a general nervous and bodily disturbance, correlated with a general mental disturbance, of an intensely unpleasant character. A similar shock is experienced when, in the process of going to sleep, we are startled by some sudden sound, which need not be especially loud. There is in such cases a diffused excitement of the nervous system, produced by the sensation, and superadded to that special excitement which is immediately correlated with the existence of the sensation. Following Professor Ladd, we may call this diffused effect the "surplus" excitation. Its occurrence is by no means confined to such exceptional experiences as that of being startled; on the contrary, all sensations

[1] Ladd's *Descriptive Psychology*, p. 199.

which have a distinctly appreciable feeling-tone appear to have a more or less diffusive character. In this respect, the difference between the organic sensation produced by a wound, and the special sensation produced by a bright light, is only one of degree.[1]

To some extent this statement may be directly verified by introspection: wherever feeling-tone is sufficiently intense, we can detect a diffused bodily and mental excitement, and concomitant change in our organic sensations. An intensely bitter taste may give rise to a cold shiver; the piercing scream of a railway whistle disturbs thought and perception, and is felt over the whole organism. A delicious taste may not only tickle the palate, but "set the whole man a-gog"; the strong pleasure or displeasure sometimes produced by stroking, tickling, or rubbing, is not immediately due to the quality and intensity of the tactile sensations themselves, but to the surplus excitement they produce. We mentioned previously that sensations in themselves agreeable may in their general effect be unpleasing, and we found that the collateral unpleasantness can only in part be accounted for by the concomitance of definitely assignable and describable experiences. But surplus excitation, with consequent modification of common sensibility, adequately explains these subtle and evasive affections of consciousness.

It is largely from this point of view that we have to account for what we are accustomed to call different kinds of pleasant or painful feeling. There are not varieties of pleasantness or unpleasantness as there are varieties of colour or sound. The distinctions we here make are ulti-

[1] Hence there is no sharply marked line of demarcation between pain-sensation and the disagreeableness of special sensation. When unpleasant organic accompaniments become prominent, pain-sensation arises.

mately referable to qualitative differences in the concomitant sensations. But the agreeableness or disagreeableness of the sensations of special sense, such as colours or tones or tastes or smells, have peculiar characteristics of this kind which are not traceable to the nature of the special sensations themselves, but to attendant experiences due to surplus excitation.

In this way we are able to account for the seeming qualitative diversity of the affective tone of different sensations which agree in being pleasant or unpleasant. "*The way we feel*," says Professor Ladd, "is not by any means precisely the same for all equally pleasurable or equally painful tastes and smells. Some agreeable sweet odours are described as 'heavy,' and others as having an 'enlivening' or 'spicy' quality."[1] Compare, for instance, the heliotrope and the Japanese lily. The strong organic effect which may be produced by a powerful odour is shown by its sometimes causing highly susceptible persons to faint. "Pleasant coolness is 'refreshing': pleasant warmth is 'cherishing.' . . . Musicians have always attached different distinct kinds of feeling to different musical instruments," and "to different keys and chords. . . . The 'grave' feeling belonging to the bass register is different otherwise than in mere quantity of pleasure-pain from the 'stirring' of the tenor."[2] These various experiences tend to induce certain moods having affinity with distinctive emotions. The same is true in a less degree of colours. "Bright light and mellow light produce differences in the character of the equally pleasurable feeling which may result."[3] Goethe contrasts the "cheerfulness" of a view as seen through yellow glass with its "mournfulness" as seen through blue glass. These differences in affective

[1] *Op. cit.*, p. 184. [2] *Op. cit.*, p. 185. [3] *Ibid.*

tone cannot be reduced to the mere difference between pleasantness and unpleasantness; and they cannot be identified with the qualitative differences between the sensible qualities which occupy attention, and which are said to be pleasant or unpleasant. We must refer them to a more or less diffused excitement of the nervous system with its organic consequences, and the resulting modifications of common sensibility.

Experimental evidence shows that pleasant and unpleasant sensations in general produce organic effects differing in a characteristic way according as they are agreeable or disagreeable. By suitable apparatus it is possible to measure variations in the volume of the limbs, and in the respiratory movements, while the subject is undergoing pleasant or unpleasant experiences. The variations may be recorded by a curve traced upon a revolving cylinder. The curve for the volume of the limb indicates, besides larger and longer variations, also smaller and shorter variations due to the beat of the pulse. These experiments justify the assumption that all sensations having a distinctly appreciable affective tone produce a diffused organic effect, which differs broadly in a characteristic way, according as they are pleasant or unpleasant. The difference, however, is not of a kind which would warrant us in regarding the organic changes as the only or main cause of the pleasantness or unpleasantness.

There thus appear to be three factors which may contribute to determine affective tone: (1) The sensation itself; (2) The diffused excitement of the nervous system which it may produce; (3) The effect of this diffused excitation on the organism by the consequent alterations of common sensibility which arise from the altered state of the internal organs. All three factors probably contribute to the result in varying degrees according to circumstances.

§ 4. **Hedonic-tone and Organic Welfare.**—Most psychologists support the general thesis that the processes corresponding to agreeable sensation promote organic welfare, and that those corresponding to disagreeable sensation are injurious. Stated more definitely, this means that agreeable process contributes to efficient discharge of function in the organs which it affects, and that disagreeable process disables the organs it affects. There are two senses in which the general proposition can be understood. The meaning may be that on the whole and in the long run a pleasant experience contributes to the welfare of the organism. The proposition understood in this sense no doubt holds good as a general rule, but it is a rule which has many exceptions. Any race of animals which should as a rule be pleased by conditions injurious to them and pained by conditions beneficial to them, would certainly perish in the struggle for existence. But to preserve the species in the struggle for existence, it is not necessary that pleasure should infallibly and universally coincide with ultimate benefit, and that displeasure should infallibly and universally coincide with ultimate injury. Hence we find that many things may be agreeable which are injurious, and that inversely many poisons are palatable. Intoxication is very bad for the health; but it may be very pleasant.

If we are to establish a universal law, we must consider only the immediate vital activity at the moment in which the pleasant or painful sensation occurs. Sugar of lead has a sweet taste, which is pleasing at the moment; this pleasing taste may in itself be favourable to vital activity, although the substance which occasions it, when introduced into the blood, acts as a deadly poison. Similarly, a bitter drug which is disagreeable to the taste may have a beneficial medicinal effect. The beneficial effect is not due to the disagreeable bitterness, but to subsequent

effects entirely disconnected with the original experience. The case of intoxication by alcohol is different. Here the very process which is correlated with pleasure involves a disablement of the central nervous system. The efficiency of the intoxicated person, both for thinking and acting, is impaired. But this kind of exception also may be explained away. The intoxicated person is disabled from accurate methodical thinking, and from precise and delicate co-ordination of movement with a view to an end. But in general he makes no serious or strenuous attempt to fulfil these functions. If he does make serious efforts of the kind, he finds them very disagreeable. On the other hand, the loose and varied flow of ideas which accompanies the pleasing phases of intoxication is much more free and expansive than in a state of perfect sobriety. We all know that champagne promotes conversation having a certain kind of brilliancy: and we all know that the opinions expressed and the arguments used are not likely to bear examination in sober moments. Even when there is no varied flow of ideas, even when a man persists in reiterating the same thing over and over again, his pleasure is connected with the fact that the point he is urging presents itself to him with peculiar vividness and intensity. Thus it appears that in the pleasing stages of intoxication a man is disabled from certain higher forms of mental function; but he does not have disagreeable feelings, simply because conscious activity in these directions is suspended. On the other hand, the kind of conscious activity which continues to go on is not impaired, but intensified, and he consequently feels pleasure.

In this last example, we have referred especially to process in the central nervous system. It is in this only that, as psychologists, we have an essential interest. Pleasure and pain are states of consciousness, and con-

sciousness is immediately correlated with neural process. Hence, the question which really concerns us is whether disagreeable processes are essentially connected with obstruction or disablement of conscious and correlated nervous activity, and agreeable processes with the free and unobstructed flow of such activity. If we state the question in this form it seems that the answer must be distinctly affirmative. Disagreeable sensations, in proportion to their intensity, obstruct and disturb mental process and the motor activities which, for their effective discharge, require conscious guidance. Everybody knows how difficult it is to think or act efficiently with a toothache or a headache, even though the desire to do so is strong. It is not merely that the painful sensations divert attention; this is true of pleasant sensations also, of similar intensity; the point is that the disagreeable sensations positively disorder and enfeeble thought and action, when the endeavour is made to think or act. Of course, if the disagreeableness arising from this or that special sensation is faint, and if the total state of consciousness is, on the whole, agreeably toned, in spite of the presence of this or that disagreeable item, the obstruction to mental activity may not be appreciable. But in principle it seems a safe generalisation that agreeable experience is favourable, and disagreeable experience is unfavourable, to the effective discharge of mental functions.

§ 5. **Affective Tone and Conative Tendency.** — Some pleasures of sense are dependent on pre-existing conations. There are sense-cravings connected with the primary organic needs, such as the need for food and drink; and the gratification of these cravings is a source of sensuous pleasure. Similarly, the induced cravings for tobacco and alcohol, which recur of themselves at intervals, give a pleasure when they are appeased which is quite distinguishable

tinuance always thwarts and never appeases the conative tendency which is essentially connected with their existence.

It should be carefully noted that we distinguish between ultimate satisfaction and the process of becoming satisfied. Ultimate satisfaction is attained only when satiety is reached—only when the subject has had enough of the pleasant experience, so that, if it were still maintained, it would cease to please him. Pleasure is found in the process of becoming satisfied, not in its completion. Its completion is its termination, and therefore the termination of its affective tone.

Any pleasing sense-experience, when it has once taken place, may, on subsequent occasions, give rise to a conation, when its conditions are only partially repeated, as when the object with which it is connected is perceived, or the corresponding idea is reproduced. The impulses and desires thus occasioned have both agreeable and disagreeable phases. They are for the most part agreeable when gratification comes quickly, or is anticipated with confidence. They are disagreeable when gratification is long withheld, especially if it be withheld in a tantalising way, so as to produce disappointment or a series of disappointments. The experience is also apt to be more or less disagreeable when anticipation is not confident, but doubtful and hesitating.

§ 6. General Theory.—Whatever conditions further and favour conation in the attainment of its end, yield pleasure. Whatever conditions obstruct conation in the attainment of its end, are sources of displeasure. This is the widest generalisation which we can frame, from a purely psychological point of view, as regards the conditions of pleasure and displeasure respectively. Its application to the affective tone of sensation is already contained in the last section.

from the pleasure immediately due to the stimulus apart from the craving for it.

Every pleasing and every painful experience at the time at which it is actually taking place has a conative aspect. In so far as the experience is pleasing, there is a tendency to maintain and develop it by whatever means may be found effective, until its pleasure-giving capacity is exhausted, or is overpowered by the intermixture of unpleasing elements. In so far as the experience is unpleasant, there is a tendency to discontinue it by whatever means may be found effective. Thus, on the level of sensation, agreeable affective tone corresponds to the positive phase of conation, and disagreeable with the negative. The pleasant experience is coincident with a conative tendency which requires for its satisfaction the continuance of the experience. The unpleasant experience is coincident with a conative tendency which requires for its satisfaction the discontinuance of the experience. While pleasure lasts, conation is being satisfied; it is working itself out. When satiety is reached, it has been satisfied; it *has* worked itself out and reached its termination. Until satiety is reached, there is always a tendency for the process to go on. If the pleasing sensory process is discontinued or obstructed before satiety is reached, the conation continues and is intensified; there is added to the tendency to continue the pleasing sensation the tendency to get rid of the unpleasing state due to its interruption. The original conative tendency, which was in process of being gratified, is transformed into a thwarted craving. Suddenly snatch away the bottle from the baby who is complacently sucking it, and you will have a picture of the situation referred to. The reverse of all this holds good of disagreeable experiences. To discontinue them, however abruptly, is to give satisfaction and not dissatisfaction. Their con-

tinuance always thwarts and never appeases the conative tendency which is essentially connected with their existence.

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A pleasing sense-experience operates as a positive factor satisfying the conative tendency which is essentially connected with it. On the contrary, an unpleasing sense-experience operates as a positive factor thwarting the conative tendency essentially connected with it. This is at the best only a vague explanation of sense pleasure-pain. It can only be regarded as being an explanation at all on one assumption. If it is supposed that, first, pleasure exists, and that, subsequently to its occurrence, the conative tendency arises as a consequence, it is a logical circle to explain the pleasure by reference to the conation. But, as a matter of fact, there seems to be no reason whatever for supposing that feeling-tone and conation are separated in time. From the very beginning they appear to coincide. From the very beginning a pleasing process is a process which tends to maintain itself.

We may perhaps hope to attain a more definite insight into the ultimate conditions which determine the feeling-tone of sensation from the physiological side. But from that side we have not at present any direct knowledge of the nervous processes involved. We can only frame hypotheses to cover the psychological data.

If we attempt to translate into physiological language the general relations of pleasure and displeasure respectively to conative tendencies, perhaps the best result we can obtain is the following. Conation in general appears to correspond to a disturbance of nervous equilibrium, and its completed satisfaction to a restoration of equilibrium. The conditions of displeasure not only disturb nervous equilibrium, but also, so long as they continue, obstruct the processes by which it tends to be restored. On the other hand, the continuance of the conditions of pleasure is a factor positively operative in the restoration of equilibrium. It is evident that even if this view of the case be

granted, there is still abundant room for further speculation as to the precise nature of the physiological processes corresponding to pleasure and displeasure respectively. The most favoured theories of the kind connect these opposite affective tones with the relations of wear and repair in the nervous system. Explanations based on this general principle assume many different forms; our ignorance of the exact nature of the complex chemical processes involved in assimilation and dissimilation of tissue, and of their connexion with functional activity and repose, leaves much room for speculation. The simplest form of statement is that when wear outruns repair the experience is displeasing, and that when repair outruns wear the experience is pleasing. On this view, however, it is difficult to account for the fact that pleasures may be exhausting.

Mr. H. R. Marshall has propounded a theory which lays great stress on the building up of tissue during periods of functional repose. Pleasure, according to him, depends upon a surplus of stored energy acquired during the inaction of the organ. Where this surplus does not exist or has been consumed, the corresponding experience will be virtually neutral, so long as repair keeps pace with wear in the course of functional activity. If wear outruns repair, the corresponding experience is unpleasant. There is much to be said in favour of this view, and Mr. Marshall has said it with great clearness and force. Fatigue is in general a source of disagreeable, and freshness of agreeable, experience. Of course, the fatigue or the freshness must be that of the special tissues engaged in the functional activity "After the quiet of the night-hours the bird-song, as we awake, is more than usually pleasurable; the rested eye sees beauty in all colours. The rubbing, at our morning bath, of the skin, which has not during the night felt the normal friction of our

clothing; the flavour of some special food to which we have been accustomed, but which has not lately been tasted--all are pleasurable."[1] A pleasant sensation, when too long continued, will become unpleasant, because the stored surplus is used up. What is a surplus relatively to one intensity of stimulation, will not be a surplus relatively to a higher intensity; hence by gradually increasing the intensity of a stimulus, we pass from pleasant to unpleasant phases of an experience. The theory accounts for many relevant facts. But it presents grave difficulties, if we attempt to base on it the whole explanation of the feeling-tone of sensation; and in my opinion it presents insuperable difficulties if we attempt to cover by its means all the pleasures and pains of perceptual and ideational activity. At present we are only concerned with sensation.

One obvious objection arises from the dependence of feeling-tone on quality as well as quantity of sensation. Why should some sensations be unpleasant at a very low intensity, and others be pleasing even at a very high intensity? Why should a comparatively small degree of bitterness or acidity be disagreeable, while a comparatively high degree of sweetness is agreeable? Mr. Marshall replies that there is a great variation in storage capacity, in the case of different sensation-processes. This explanation is probable enough in some cases. Where a function recurs with great frequency and regularity, and without much variation of intensity, as respiration does, we should not expect any large storage of energy. On the other hand, where stimuli occur irregularly, and with great variations of intensity, the organism can only provide against them by storing up a surplus in advance. But there are a

[1] *Pain, Pleasure, and Aesthetics*, p. 200.

large number of instances in which no such explanation appears applicable. Why should the same person dislike the smallest trace of vanilla, and keenly enjoy cloves or cinnamon? Why should the same person enjoy beef and hate mutton? To account for such differences by variation in storage capacity seems forced.

A more important difficulty is connected with the conception of a surplus. How are we to fix what is, and what is not, surplus energy? Mr. Marshall says that there is a pleasure-giving surplus "whenever the energy involved in the reaction to a stimulus is greater than the energy which the stimulus habitually calls forth," and that pain is experienced "whenever the physical action which determines the 'sensation' is so related to the supply of nutriment to its organ that the energy involved in the reaction to the stimulus is less in amount than the energy which the stimulus habitually calls forth."[1] There is ambiguity in this statement. The effect produced by a stimulus varies with its intensity; when Mr. Marshall speaks of "the stimulus," does he mean the same kind of stimulus in the same degree of intensity, or the same kind of stimulus in varying degrees of intensity? If he means to include varying degrees of intensity, his case obviously breaks down altogether; for when a stimulus is unusually intense it is often unpleasant, although the effect which it produces is greater, and not less, than that which we are accustomed to

On the other hand, if he means the same stimulus in the same degree of intensity, only a comparatively small group of facts is available for verifying his hypothesis. The instances in which the same kind and intensity of stimulus yields alternately pleasure and pain to the same

[1] *Op. cit.*, pp. 204-205.

person are relatively infrequent. The best example, perhaps, is the gradual decrease of pleasure when a pleasing stimulus is prolonged. Here not merely the affective tone, but the experience itself, appears to become fainter; but it is by no means so clear that it continues to remain fainter when it becomes positively disagreeable. Unpleasant experiences may be continued for a very long time indeed before they show any appreciable diminution of unpleasantness; and while they continue, it cannot be said that the effect of the stimulus is smaller than its habitual effect. When abatement of pain begins, the effect of the stimulus is smaller, the total experience becoming fainter. On Mr. Marshall's view we should expect, as an accompaniment of the diminishing effect of the stimulus, an increase and not an abatement of painfulness. This leads up to another objection; the intensity of unpleasantness appears to be, in general, proportioned to the intensity of the unpleasant experience. If Mr. Marshall were right in affirming that unpleasant stimulation produces a smaller effect than pleasant stimulation, we should expect unpleasantness of all kinds to be very much fainter than we actually find it to be.

We have discussed Mr. Marshall's views because they form a very favourable example of the theory which traces pleasure-pain to wear and repair of nervous tissue. In general, we may conclude that a large part of the explanation, at least for sense pleasure and pain, may be found on these lines. But no theory framed on these lines has been so formulated as to cover the whole ground successfully even for sensation, and they are all beset by special difficulties. After all, it is not, *à priori*, likely that merely quantitative conditions will be found adequate to account for the facts. Considering the great complexity of the chemical processes in organic tissues in interaction with

the blood-supply, there may be all kinds of qualitative as well as quantitative variations. For instance, the accumulation of waste-products in the blood may be a very important factor. It is possible that what takes place in repose and restores the freshness of organs is rather the removal of these waste products than the actual building up of tissues. There are considerations which tend to show that the building up of tissue takes place mainly during functional activity rather than during functional repose. We know that tissues suffer atrophy or degeneration if they are long disused. We merely refer to this point in order to show how speculative and insecure, in the present state of our knowledge, hypotheses of this kind are.

BOOK III.

PERCEPTION.

PART I.—PERCEPTUAL PROCESS IN GENERAL.

CHAPTER I.

INSTINCT.

§ 1. **Introductory.**—When we say that a bodily action or mental process is instinctive or due to instinct, whatever else may be meant it is implied that the bodily action or mental process is not acquired through experience but that it has its source in the inborn constitution, bodily or mental or both, of the individual. On the other hand, it is clear that not all connate endowments of this kind are properly called instinctive. Otherwise the term would cover all cases of reflex action, and it could be extended to the behaviour of plants as well as animals, *e.g.* the opening and closing of flowers. We have therefore to fix more precisely the special nature of the congenitally determined modes of behaviour to which the word is strictly applicable.

For this purpose we shall begin by considering a certain class of actions which all agree in calling instinctive. These actions are especially prominent and conspicuous in the life of animals as contrasted with human beings. Just as

the members of any species of animals owe to their inherited constitution a certain common type of bodily structure, adapted to the conditions of their existence, so they exhibit in common certain characteristic modes of behaviour of a peculiarly complex kind, which are universally recognised as instinctive. We have to inquire what distinctive features these actions possess to mark them off from other processes which are also congenitally determined. We may then consider how far the same characteristics are discoverable in other activities, and whether it is on that account advisable to give the term "instinct" an extended application. Our first step must be to make plain by examples the nature of the animal behaviour which is indisputably instinctive.

§ 2. Examples of Instinctive Behaviour in Animals.—We may broadly classify the instinctive actions of animals according to the function they fulfil in the general scheme of animal life.[1] We may distinguish (*A*) those connected with the procuring of food; (*B*) those connected with defence or protection; (*C*) those connected with the care of offspring; (*D*) those connected with the relation of the sexes.

The procuring of food may include a number of more special processes: (1) The search for prey or other nutriment; (2) lying in wait; (3) pursuit; (4) springing on prey; (5) seizure of prey; (6) securing it when seized. Besides these main divisions, there are special modes of procedure found in some animals, such as throwing out a bait, or constructing traps, or driving the victims from their hiding places by frightening them.

Some animals lie in wait without preliminary search, and seize their prey only when it comes within reach, either by

[1] This classification is due to G. H. Schneider's work, *Der Thierische Wille*.

merely extending some part of the body or by a spring. Lizards and frogs, for the most part, do not pursue their prey even when they catch sight of it; but follow it with their eyes, and quietly waiting till it is within reach seize it by shooting out the tongue, head, or feet, or pounce upon it with a sudden leap.

Lying in wait is often accompanied by other special activities which serve to conceal the watcher, to attract the prey, or to ensnare it. Spiders, for example, construct webs as snares. According to Darwin,[1] the large Epeira, when a big insect is caught, makes its web revolve rapidly by a dexterous movement, and at the same time emitting a band of threads from its spinners soon envelops its prey in a cocoon-like case. It then examines its victim, gives the fatal bite and, retreating, patiently waits till the poison has taken effect.

Certain crabs disguise themselves past recognition by a covering of sea-weed or other suitable material before lying in wait. Schneider stripped one of its disguise and found its back and limbs covered with short thick bristly hairs hooked at the end. He then placed it in a basin of water containing sea-weeds. The crab drew towards it a small bundle of these, held it with the left claw, and broke a portion off with the right. Then he took hold of the bundle with one claw, raised it slowly to his forehead, placed it there and moved it to and fro till it became fastened to his hooked hairs. He then pulled at it again, as if to see if it were firmly placed. After this, he took up another bundle and repeated the performance until forehead, back, and limbs were all thickly covered.

Many animals may be said to stalk their prey, approaching it stealthily and using cover. The cat's hunting of

[1] *Voyage of the Beagle.*

birds is a familiar example. Crabs, according to Schneider, behave in a similar way.

Instinctive activities of a protective or defensive character assume many special forms, such as:—crouching in presence of an enemy; flight and hiding; fighting; burrowing in a suitable place; construction of dwellings, sometimes with chambers and passages; watchfulness in coming out of shelter or hiding place; examination of whatever appears strange or unfamiliar, *e.g.* a trap; imitation of an enemy by gestures or noises.

We may here especially refer to the constructive activity of animals in making burrows and nests. The trap-door spider makes a tube in the earth with a door at the entrance. Minute spiders of this species, probably not long out of the egg, make correspondingly minute holes with correspondingly minute doors, gradually enlarging their dwellings as they themselves increase in size. If an enemy endeavours to open the trap-door, the spider frequently seizes hold of its internal surface and, applying her legs to the walls of the tube, forcibly resists the entry of the intruder. Ants and termites construct more or less elaborate subterranean dwellings, hollowing out chambers and galleries in the sod. "The wood-ant piles up a heap of leaves, twigs, and other vegetable refuse so arranged as to form an orderly series of galleries."[1] Beavers construct dams. But the most familiar example is the nest-building of birds, which may serve as a typical instance of instinctive behaviour.

The congenitally determined activities connected with the care of offspring are exceedingly manifold and varied. They include the deposition of eggs in suitable places and other arrangements for their security, nest-building, in-

[1] *Encycl. Brit.*, vol. ii., p. 86.

cubation, shifting eggs and pupae from place to place as varying circumstances require, feeding the young and keeping them clean, hiding of eggs or young by covering them up, by taking them in the mouth or between the feathers or under the wings.

We may select for illustration the case of the deposition of eggs in suitable places so as to arrange for their security. In most insects, the whole care of offspring consists in depositing eggs in such a place and manner as to provide beforehand for the future life of the larva, its food, safety, and transition to the pupa state. These results are, of course, in no case ends aimed at by the mother-insect herself. She has no opportunity of learning about them by experience or otherwise. She knows nothing of what is going to happen after deposition of the eggs, and the needs and habits of the larvae are quite different from her own. It is not she who provides for their future, but nature, which uses her as an instrument to that end. There is a beetle which sets about laying its eggs in the following manner. The male and female having found a mass of dung, detach a bit from it and make this into a ball with their legs. Then one of the beetles grasps the ball in front and the other behind; one pulls with its hind legs, the other pushes with its fore legs. In this way they roll the ball along until they find soft earth. Here they dig a deep hole. The female lays an egg in the ball of dung. The next step is to roll the ball into the hole. Finally they fill up the hole again and leave it.

Besides the specialised modes of behaviour which can be brought under these heads, there are more simple and general activities which also have an instinctive character. "By the patient study of the behaviour of young birds, such as chicks, pheasants, ducklings, and moorhens, it can be readily ascertained that such modes of activity as run-

ning, swimming, diving, preening the down, scratching the ground, with the characteristic attitudes expressive of fear and anger are so far instinctive as to be definite on their first occurrence."[1] They are from the outset definite enough to be serviceable without requiring to be learned by experience or imitation. The same holds good for adjustment of the organs of sense such as are involved in looking and listening.

§ 3. **The purely Biological View of Instinct.**—It is in part possible to give an account of the facts relating to the instinctive movements of animals without introducing psychological conditions at all. They may, from this point of view, be regarded merely as special forms of vital adaptation in general, and explained by the same principles which are held by the biologist to account in general for the congenital characters by which the various species of plants and animals are pre-adapted to maintain the life of the individual and the race. It belongs to the innate constitution of a spider that it should spin a web; but it also belongs to its innate constitution that it should possess spinnerets. Both the spinnerets and the aptitude for using them are complex arrangements for the preservation of the spider's existence, and that of the species to which it belongs. Neither are acquired by anything which the spider does.

Darwin in his *Voyage of the Beagle* mentions a land-crab which opens cocoa-nuts. "The crab begins by tearing the husk fibre by fibre, and always from that end under which the three eye-holes are situated; when this is completed, the crab commences hammering with its heavy claws on one of the eye-holes till an opening is made." "I think," says Darwin, "this is as curious a

[1] Lloyd Morgan, *British Journal of Psychology*, vol. ii., pt. 3.

case of instinct as ever I heard of, and likewise of adaptation in structure between two objects apparently so remote as a crab and a cocoa-nut tree." Here instinct and structural adaptation are distinguished. The distinction is not, however, fundamental for biology. The crab has a congenital equipment in the way of claws, etc., for dealing with cocoa-nuts in the way described. But it has also a nervous system which is as much part of its bodily structure as its claws. It is because this nervous system has a certain inherited constitution that the animal is capable of performing certain complex series of movements when appropriate conditions occur.

Instinct, considered in this light, distinctively consists in a special pre-adaptation of the nervous system congenitally determined so as to give rise to special bodily actions in response to appropriate stimuli. "The cat," as Professor James says, "runs after the mouse, runs or shows fight before the dog, avoids falling from walls or trees, shuns fire and water, etc., not because he has any notion either of life or of death or of self or of preservation. He has probably attained to no one of these conceptions in such a way as to re-act definitely upon it. He acts in each case separately and simply because he cannot help it; being so framed that when that particular running thing called a mouse appears in his field of vision he *must* pursue; that when that particular barking and obstreperous thing called a dog appears then he must retire, if at a distance, and scratch if close by. . . . His nervous system is to a great extent an organised bundle of such reactions."[1]

This is the right point of view from which to deal with the *biological* purposefulness of instinctive movements,

[1] *Principles of Psychology*, vol. ii., p. 384.

with their adaptation as means to the fulfilment of ends in the general scheme of animal life, which are entirely beyond the ken of the individual who performs them. In the economy of nature the actions of the dung-beetles in depositing their eggs are means by which the race of dung-beetles is preserved. It is as if they were especially designed for this end. But there can be no sort of prevision of this end on the part of the beetles themselves when they roll the ball of dung or push and pull it along, etc. If we ask why the instinctive movements are thus pre-adapted to subserve remote ends to which the individual animal itself is blind, we must look for the answer in the general theories by which biologists account for the origin of adaptive arrangements in the various species of plants and animals.

The fact that we are here dealing especially with pre-adaptations of the structure of the *nervous system* makes no essential difference. Whatever principles, such as natural selection and heredity, will account for a sparrow being congenitally equipped with wings adapted for flying, will also account for its having the connate modification of nervous structure for executing the requisite movements, without needing to acquire them by practice.

Instinctive endowment is, in this respect, merely one form of vital adaptation among others, to be explained in the same way as the ingenious arrangements found in orchids and other flowers for cross-fertilisation by insects, or the construction of the eye as an optical instrument, or the complex combination of processes through which food is digested or the blood supplied with oxygen.

Earlier writers were in the habit of insisting on the complete uniformity of instinctive behaviour in all members of a species, and on its uniform transmission from generation to generation. We shall see presently that

instinctive conduct is to a large extent modified by experience. But besides this we have also to recognise the occurrence of congenital variations. The connate constitution of the nervous system is no more fixed and invariable in different individuals than their other bodily organs. Each conforms to the general type, but each does so in its own special way. Thus ants of the same species in the tendance of their eggs and larvae conform to the same general type of behaviour. But within the same nest a careful observer is able to detect manifold more or less conspicuous differences in the conduct of individual ants, differences, so to speak, due to individual character. Similar variations are also to be found in the nest-building of birds. Variability of this kind is essential to the Darwinian theory of the origin of species, because "some degree of variation in instincts, . . . and the inheritance of such variations, are indispensable for the action of natural selection."[1]

§ 4. **The Psychological Factor as indispensable to Instinct.**—We have just seen that some features of instinctive behaviour in animals are to be accounted for, in the same way as other facts of vital adaptation, by such principles as heredity, congenital variation, and natural selection. But this point of view is inadequate because it fails to mark off what is essentially distinctive of instinct as compared with other modes of vital adaptation. It is not enough to say that instinct is especially a connate disposition of the nervous system as distinguished from other parts of the body structure. For this would include reflex actions.

Now biologists who tend to ignore the importance of psychological factors also tend to regard as unessential the

[1] *Origin of Species*, Ch. VII.

distinction between reflex actions and instinctive movements. They propose to define instinct as consisting in complex combination of reflexes. This position is natural when the problem is approached in a purely biological way. But scrutiny of the facts from the psychological point of view shows that it is quite indefensible. Reflex action is of a nature fundamentally different from instinctive conduct. The difference is that instinctive conduct does and reflex action does not presuppose the cooperation of intelligent consciousness, including under this head interest, attention, variation of behaviour according as its results are satisfactory or unsatisfactory, and the power of learning by experience.

Reflex movements occur in response to a stimulus which frequently also gives rise to vivid sensation with strong affective tone. But they may also occur without any distinctively appreciable sensation. Further, when the sensation *is* present, there is no reason for regarding it as a factor generating or influencing the reflex process itself. It is rather a collateral result of the stimulus, serving merely to arouse attention to the reflex act and to the conditions under which it occurs so as to give occasion to further activity which is not of the reflex type. The obtrusive sensation accompanying a sneeze, for example, does not determine the movement of sneezing, but rather such further action as the attempt to suppress this or the turning of the head aside or the use of a handkerchief.

But instinctive conduct is related to sense-impressions in a fundamentally different way. The course of the instinctive activity is throughout *guided* by and *adjusted* to complex and variable combinations of different sense impressions. This is plain in such instances as the behaviour of dung-beetles in depositing their eggs, of the

cat hunting a mouse or playing with a ball of worsted, of the bird building, of the spider spinning a web, and of an ant dragging a load to its nest. Now, in our own experience, the guidance of motor processes in their varying phases and stages by complex and changing groups of sense impressions is found in two cases. It is found in the highest degree in actions which involve attentive consciousness; it is also, though to a much more limited extent, found in routine processes for which the nervous system has been previously educated through attentive activity so that they become capable of occurring without attention or with a minimum of attention.

To which of these types is the instinctive behaviour of animals most akin? There is no difficulty in answering this question. Instinctive movements from the outset bring into play whatever mental activity the animal may be capable of. They do not go on while the animal is pre-engaged with something else. Either they occupy fully attentive consciousness, or consciousness is not concerned with them at all. The last alternative seems *prima facie* improbable and further consideration justifies us in dismissing it altogether.

In the first place the whole behaviour of the animal throughout the course of an instinctive activity, even on its first occurrence, shows all the outward characteristics of attentive process. It is marked by adaptation of the sense organs for certain stimuli rather than others, and is throughout pervaded by the attitude of waiting, watching, and searching for future impressions. In this respect, it is sharply contrasted with the mere reflex. The reflex reaction occurs when the stimulus is applied as a loaded pistol goes off when the trigger is pulled. It is not prepared for by previous activity. Until the appropriate stimulus occurs the animal remains passive. On the other hand,

the bird gathering materials for its nest, ants tending eggs and larvæ, a cat or a crab lying in wait for prey, take the initiative, so to speak, and go out to meet coming impressions. Thus the successive parts of a complex instinctive process, instead of appearing to the observer as a mere sequence of separate reactions each evoked by its own separate stimulus, irresistibly suggest conative unity pervading and connecting them as stages or phases in the development of one continued action. The cat's procedure, for example, in hunting a bird, from its first prowling in pursuit of prey until the final killing of the bird, seems throughout its course to consist of successive steps linked together by continuity of attention depending on one pervading appetition which finds satisfaction only in carrying out the process to its final result.

This view is further confirmed by another feature of instinctive behaviour. We find in it clear evidence of what Lloyd Morgan called "persistency with varied effort"; where a certain mode of action fails to have a certain effect, the activity is renewed again and again under relatively novel forms until success is reached. A dung-beetle rolling its dung-ball along the sand finds itself in a hollow, the sides of which are too steep for the ball to be pushed up from below. The beetle accordingly butts down the sand at one side "so as to produce an inclined plane of much less angle."[1] In investigating the cell-making instinct of the hive-bee, Darwin found examples of this persistency with variation of behaviour. "It was really curious to note in cases of difficulty, as when two pieces of comb met at an angle, how often the bees would pull down and re-build in different ways the same cell,

[1] Lloyd Morgan, *Animal Life and Intelligence*, p. 458, as quoted by Myers, *British Journal of Psychology*, vol. iii., pt. 3, p. 214.

sometimes recurring to a shape they had at first rejected."[1] There is a species of solitary wasp (Ammophila) which in completing its nest blocks up the entrance with earth. In doing this the procedure adopted varies much in its details for different individuals. One wasp, which performed the work in a particularly elaborate way, finally "scampered around hunting for some fitting object to crown the whole. First she tried to drag a withered leaf to the spot, but the long stem stuck in the ground and embarassed her. Relinquishing this, she ran along a branch of the plant under which she was working, and leaning over picked up from the ground below a good sized stone, but the effort was too much for her. . . . She then started to bring a large lump of earth, but this evidently did not come up to her ideal, for she dropped it after a moment and seizing another dry leaf, carried it directly to the spot and placed it directly over the seat."[2]

Such behaviour as this shows clearly that instinct does not consist merely in a congenital arrangenent through which a certain stimulus elicits certain movements. What it essentially involves is rather an impulse which requires for its satisfaction the doing of something in the sense of achieving a certain perceptible result. If the given situation at once evokes the movements required to produce this result, there is no renewal of effort with variation of procedure. Otherwise what we can only call fresh attempts are made involving more or less novelty of adjustment. To some extent the nature of the new adjustments may be provided for by the inherited constitution of the nervous system. But this explanation seems plainly inadequate to cover all the relevant facts. We must also recognise that

[1] *Origin of Species*, Ch. VII., p. 208. [2] Mr. and Mrs. Peckham, *Instincts and Habits of Solitary Wasps.*

modes of action are brought into play which have been learnt in the course of previous experience.

This brings us to the final consideration which, taken in conjunction with the others already mentioned, justifies the position that instinctive activity essentially involves intelligent consciousness. Animals in their instinctive behaviour show the capacity of profiting by the lessons of previous experience. This does not mean merely that their mode of procedure is modified on repetition; for this might be explicable without supposing intelligent adaptation. The point is rather that it becomes modified in special ways. It becomes more discriminative and specialised, and it is also generalised by being transferred through association to new conditions which do not originally evoke it. The series of actions by which animals provide themselves with food is initially determined by their inherited constitution. But they learn by experience to search for it in the special places where they have previously found it in greatest abundance, and to neglect those which have proved barren. It is also to a large extent by actual experiment that they learn to distinguish between different kinds of food as more or less agreeable so as to prefer what best suits their taste. The young chick, untaught by previous experience, pecks instinctively at all small objects. It is only through trial that it learns to distinguish between what is food and what is not and between what is nice and what is nasty. "The inherited tendency of the chick is to peck—'to peck at everything not too large.' But experience very rapidly teaches that it is pleasant to peck at some things, such as yolk of egg, or cabbage moth caterpillars—and very unpleasant to peck at others, such as cinnabar caterpillars or bits of orange peel. The tendency to peck at one sort of object is accordingly confirmed. The tendency to peck at others is inhibited. . . . The instinctive ten-

dency is regulated, narrowed and defined, as it becomes a habit in which experience has played its part."[1]

In this way instinctive activities become gradually more specialised and discriminative. But experience also operates in another way. It brings about the extension of instinctive modes of behaviour to new circumstances so that they occur in response to conditions which would not otherwise evoke them. Reactions are thus acquired to which there is no initial tendency. There is nothing in the inherited constitution of crows or other birds to prompt them to follow a plough. They learn to do so because they have found by experience that where the plough goes there is an abundant supply of food. "The sight of a man or the sound of a human voice cannot under ordinary circumstances stimulate a wild animal that does not prey upon man to expect food or prepare to receive it. But if the same animal is caught and kept in captivity, it will soon" respond in the appropriate way not only to the sight of its food but at the sight of the keeper who feeds it. "Fish who are accustomed to be fed, will come to the surface and be ready to snap as soon as anyone approaches the tank."[2] The following example, given by Mr. Lloyd Morgan, may be taken as typical. "A moorhen chick, for whose benefit we had dug up worms with a spade, and which, standing by, jumped on the first turned sod and seized every wriggling speck which caught his keen eye, would run from some distance to me as soon as I took hold of the spade."[3] Such instances, which are of very frequent occurrence, show that objects, at first unconnected with an instinctive impulse, may come to arouse it through their acquired meaning as reproduced by association.

[1] Hobhouse, *Mind in Evolution*, p. 87, summarising Lloyd Morgan, *Habit and Instinct*, pp. 40-42. [2] Hobhouse, *ibid.*, p. 96.
[3] *Habit and Instinct*, p. 148, quoted also by Hobhouse.

Now it may seem, at first sight, that something similar takes place also in the case of purely reflex action. The mere threat of tickling has the same effect as the reality for some persons. But further analysis shows that there is an important distinction. The person who has a fit of laughing on the mere threat of tickling behaves as he would do if he were being actually tickled. He does not merely make preadjustments preparatory for dealing with the actual stimulus when it shall arrive. The moorhen chick, on the contrary, when it saw Mr. Lloyd Morgan with his spade, did not begin at once to snap with its beak at worms which were not there. The instinctive impulse was aroused, but it expressed itself in a form intelligently adjusted to the special circumstances. It took the form of running towards the man with the spade as a preparatory step in the total activity of procuring food.

At this point we must raise an important question of theory. It is generally admitted that, so far as instinctive activity is developed and modified under the influence of experience, it becomes intelligent. But it is also commonly held that it is originally unintelligent. On this view, there can be no intelligence on the first performance but only on its subsequent repetition. The assumption is that there can be no prevision, no kind of reference to the future, except on the basis of prior experience. Hence instinctive action must in the first instance be entirely blind, and therefore unintelligent; for intelligence involves some cognisance of an end pursued. On the other hand, after previous experience of results more or less foresight becomes possible. "In this condition an impulse acted out may be said to be acted out, in part at least, *for the sake* of the results. . . . An insect that lays her eggs in a place where she never sees them hatched must always do so 'blindly'; but a hen who has already hatched a brood

can hardly be assumed to sit with perfect blindness on her second nest. The hen's idea of the chickens would probably encourage her to sit; a rat's memory, on the other hand, of a former escape from a trap would neutralise his impulse to take bait from anything which reminded him of the trap."[1]

It is a grave objection to this theory that it gives no sufficient answer to the question: what takes place when the process of learning by experience is actually going on? According to the theory, intelligence first comes into being only when the instinctive action is repeated on a new occasion with adaptive variation of behaviour determined by past experience. But it is not on the subsequent occasion that the animal first learns the lesson. It is only then that it begins to *profit* by what it has learned. But this presupposes that the actual learning by experience has already been achieved. The state of having already learned, as shown by change of behaviour in subsequent situations otherwise similar, presupposes the learning itself at the time when the original performance was taking place. It follows that, if learning by experience is itself an intelligent process, the intelligence involved in instinctive activity cannot be purely an after-effect of learning by experience. To assert this is to assert that intelligence first arises as a consequence of previous intelligence. Now, if we set aside the special case of the original performance of instinctive movements, all else that we know seems to show that learning by experience is conditioned by attention and continuity of interest leading to the formation of appropriate dispositions and associations and so to acquirement of meaning, etc. There is therefore a strong presumption that this will be so in the case of instinctive activities also.

[1] James, *Principles*, II., p. 390.

It may be said that this is only a presumption and needs to be tested by relevant facts. But the opposite view that instinctive activity *must*, at the outset, be completely blind is also a presumption of the same kind. As we shall see, it has been taken to be self-evident without sufficient examination. If we turn from such *a priori* arguments to actual behaviour of animals we find that the evidence very strongly confirms the hypothesis of original intelligence. As I have already shown, animals in their instinctive actions do actually behave, from the outset, as if they were continuously interested in the development of what is for them one and the same situation or course of events; they actually behave as if they were continuously attentive, looking forward beyond the immediately present experience in preparation for what is to come. They apparently watch, wait, search, are on the alert. They also behave exactly as if they appreciated a difference between relative success and failure, trying again when a certain perceptible result is not attained and varying their procedure in so far as it has been unsuccessful. All these characters are found in the first nest-building of birds as well as in the second; they are found also in courses of conduct which occur only once in the lifetime of the animal.

It seems clear that instinctive behaviour would be regarded as originally intelligent were it not for the assumed self-evidence of the proposition that intelligent action implies prevision of results which is possible only through previous experience. We must therefore examine this position.

§ 5. **The Blindness of Instinct.**—An action is "blind" inasmuch as it leads to results which are not in any way aimed at or anticipated by the agent. Now all actions whether of men or animals have unforeseen consequences. Hence they are all partially blind. But failure to foresee

some results is quite compatible with the power to foresee others. Blindness in one direction must not therefore be taken, without special reasons, as evidence for blindness in other directions. We must not assume that because a bird in its nest-building has not in view the laying of eggs and the rearing of its future brood, it therefore has no aim at all. It may be pursuing a proximate end, though it is blind to more remote consequences which appear to the onlooker as ends fulfilled by its action.

The special question which here concerns us is whether even such proximate ends can be sought after by an animal, apart from experience of the results of similar behaviour on previous occasions. It is, in the first place, important to notice that, even in the first performance of an instinctive act, the influence of previous experience is by no means altogether excluded. "To my mind," says Dr. Myers, "it is certain that on the occasion of the chick's first peck or the duckling's first swim the bird is dimly, of course very dimly, conscious of the way in which it is about to act. I believe this because no organism can ever execute a new movement which does not involve other movements that have been performed previously. . . . When a chick first attempts to peck, many of the muscles then called into action must have been contracted before. Thus the feeling of activity arising on the occasion of a chick's first peck is not altogether a new one. It is related as each of our own experiences is related to past experiences. And the very vague awareness of results which is associated with those previous feelings of activity gives the chick a vague awareness of the result of its first peck, before it has actually performed it." [1]

Dr. Myers seems here to claim too little rather than too

[1] *British Journal of Psychology*, vol. iii., pt. 3.

much for the possible influence of previous experience in the first performance of an instinctive action. In many cases, of course, it will yield only a very rudimentary awareness of results. But in others it may be much more definite. It may indeed be quite definite. The movements of flight and concealment on the part of a bird when it first sees a hawk may be movements which it has frequently executed before, so that it has a full anticipation of their perceptible results. Yet the performance of just these movements when a hawk is seen for the first time is congenitally determined, and does not depend on previous experience; it is therefore, to this extent, the first expression of a special instinct. It is so because the occurrence of this special mode of behaviour in this special situation is not due to learning by experience in past situations of like nature. Its instinctive character is therefore independent of the previous performance of similar actions in cases where hawks have been absent. It is even independent of the question how far the ability to execute the movements themselves is primarily innate or acquired.

The conditions under which solitary wasps finally close up the entrance to their nests seem to be very largely of this nature. They have, probably, had experience in the past of the sort of procedure required to stop a hole, so that they may be said to know how to do it. What has to be accounted for by a special instinct is that the members of the species regularly stop this particular hole under particular circumstances and that they do so independently of any previous experience of satisfactory consequence from behaving in this way under the special conditions.

Past experience, then, is a contributory factor in the first performance of all instinctive actions except the very earliest; and in some cases it may be a very important

factor, sufficing to give quite definite anticipation of immediate results. None the less it is far from fully explaining all the relevant facts. If all intelligence be supposed due to previous experience of results, then the degree of intelligence must in every case be proportional to the relative amount of such prior preparation. But it is plain that this is not so. Selective attention, continuity of attention, persistency with varied effort, pervade the whole course of activity in the nest-building of birds in a way which cannot be accounted for by the relatively insignificant part in the process which is all that we can assign to previous experience of results. It is the whole specialised system of movements in their co-ordination and co-adjustment which appears to require the control of interest and attention, not merely such partial constituents of it as may happen to have occurred previously either in isolation or in other contexts. Besides this, the hypothesis of Dr. Myers, taken by itself, leaves untouched our original difficulty. If all intelligence is an after-effect due to prior learning by experience, we have no satisfactory account of the original processes in which the lesson is first learned.

We are therefore driven to the conclusion that instinctive activities have an intelligent character which is not wholly traceable to previous experience. But how is this possible? In answering this question we have first to fix the kind and degree of intelligence which the conditions of the case require us to assume. It seems sufficient to postulate (1) attention selective and prospective, making possible the guidance of motor activity by complex and variable groups of sensory data; (2) appreciation of relative success and failure, making possible persistency with varied effort.

Selective attention depends upon interest, and there is no question that interest is congenitally determined in-

dependently of prior experience. It is owing to a connate predisposition that the hawk, for example, concerns itself with small birds and their movements rather than with cows, horses, grass or flowers. The interest consists in the instinctive impulse with connected affective tone and emotional excitement. The question is whether this impulse is initially a conation in the sense of being directed to an end which can be regarded as pursued by the animal itself. This depends on the nature and conditions of the prospective attitude of attention as expressed in watching, waiting, or searching. If watching or waiting presupposes definite anticipation of what is coming, such as can only be derived from prior experience on similar occasions, it follows that apart from prior experience the instinctive impulse must be entirely blind.

But there is no sufficient reason for assuming this. The prospective attitude of mind may consist merely in looking for further development of the actual situation without forestalling the special nature of the development. For this, it is only necessary to assume an awareness of the present situation as transitional—as something which not merely *is* but *is to be*. Such rudimentary reference to the future is not wholly indeterminate; it is specific inasmuch as it is concerned with the further development of a specific situation and, more particularly, of certain selected factors within it. It is vague inasmuch as the animal has no clue to the particular nature of the changes which are to take place. The important point is that the situation is apprehended as alterable. This is enough to make conation possible. For when what is actually present is apprehended as alterable, it is possible to want it altered in such a way as to satisfy the felt impulse.

Thus, in the first performance of an instinctive action, there will not be a purely blind restlessness, but a

rudimentary conation or active tendency directed towards an end which is an end for the animal itself, and does not merely appear as if it were so to the external observer. It is true indeed that the animal will initially have no anticipation of the special means by which its end is attainable, or the special form which it will assume when attained. Only experience of results can yield definite prevision of this kind; and in typical cases of animal instinct the requisite experiences are first obtained in the execution of movements provided for in the inherited constitution of the nervous system. Nature educates the animal by thus supplying it, from the outset, with the appropriate data from which it has to learn.

In the light of the foregoing discussion, it is easy to account for the instinctive appreciation of relative success and failure as shown in persistency with varied effort. We have here only one case of the general principle that in the pursuit of ends the subject has to learn more or less by actual trial what it is that he really wants and does not want. The instinctive impulse requires for its fulfilment a course of behaviour leading, step by step, to certain perceptible results. But at any stage of the process the effect produced may be other than what is needed to satisfy the congenital interest. When this happens the perceived result will become a centre of dissatisfaction, and renewed attempts will be made to get some other instead of it. A solitary wasp, for instance, which stores spiders in her nest, often finds difficulty in getting them through the hole at the entrance. This leads to persistent effort with varying adjustment of behaviour. In one instance the wasp managed to get the spider "past the entrance, but it stuck in the gallery, and after working at it in that position for a time she brought it out, subjected the legs to a severe squeezing, and tried again. It was still a very

bad fit, but by turning it about and pulling at it, she succeeded in getting it in."[1]

§ 6. **Instinct as a Psychical Fact.**—Instinctive behaviour is essentially conditioned by intelligent consciousness. The question which we have now to consider is how far this psychical factor forms part of the instinct as well as a condition of its expression. Of course the general capacity for attention, emotion, and learning by experience is not itself instinctive. To assert this would be to deprive the term "instinct" of all distinctive meaning. We must here impose the same kind of limitation as in the case of motor activity. It is not the general capacity for performing movements which is instinctive. What is ascribed to instinct is rather the fact that under certain special circumstances a certain special train of movements is executed independently of previous learning by experience, so that it has to be referred to the connate constitution of the nervous system. In some cases, the aptitude for making the appropriate movements is itself more or less completely congenital. In others, the aptitude for executing the movements may have been in a greater or less degree acquired in the course of past motor process; but their being performed in this or that special situation is instinctive because it is not traceable to previous experience of satisfactory results following similar behaviour in like circumstances.

The same principle is to be applied to psychical states and processes. The general capacity for being interested and attending is not an instinct. But where we find an animal showing emotional excitement in the presence of a certain special object and fixing attention on this, though it has not been actually harmed or benefited by it in the

[1] Peckham, *ibid.*, quoted by Hobhouse, p. 69.

past and is not being actually harmed or benefited by it in the present, such interest and attention may be properly called instinctive, because it is only through a connate disposition that they are elicited in response to this particular object rather than to others. Thus, it is instinct when the kitten occupies itself with a dangling ball of worsted in preference to other things which happen to be present at the same time, or when an animal shows anger or fear in the presence of its natural enemies, though it has never seen them before. Some congenital interests are conditioned not only by external objects, but also by organic sensations such as hunger or sexual excitement; and are not elicited when these are absent. Thus birds build nests only in the spring, when they are under the influence of sexual feeling.

The power of learning by experience must also be regarded as instinctive if and so far as, owing to connate dispositions, it exists in a special degree for certain kinds of experience rather than others. In general, an animal learns much more rapidly and accurately along the lines of its instinctive interest than in other directions. Dogs and cats develop and perfect their own natural activities in hunting, fighting, etc., much more easily than they acquire the "unnatural" trick in which they are drilled for exhibition at shows.

The importance of this factor varies with different species according as their congenitally determined behaviour is more or less adequately adapted from the outset to the conditions of their existence without need for further modification through experience of results. In general, the lower we descend in the scale of animal life, the more restricted is the range of learning by experience; and the higher we rise, the more extended and varied is the field for acquired adjustments of behaviour. Thus, insects have relatively

little to learn, because their instinctive movements are initially preadapted in a very definite and specialised way to definite specialised exigencies of their life-history. On the other hand, the instinctive procedure of dogs and apes is originally, for the most part, far less adequately adapted to their needs. Hence they have more to acquire by experimental activity, and in consequence the specialised capacity for learning what is useful to them is a proportionately more important part of their congenital equipment.

The special power of learning by experience in certain directions is, of course, in part dependent on connately determined interest. But it also involves a special capacity of *retentiveness* for certain special experiences connected with instinctive activities.

§ 7. **Instinct in Human Beings.**—To what extent we are to recognise the presence of instincts in human beings depends on the way in which we choose to define the term "instinct." In animal behaviour we have noted a variety of congenital factors all of which may enter into the constitution of instinctive conduct. But some of these factors may be clearly present, while others are completely or almost completely absent. It then becomes a question what factors we shall treat as essential and what as unessential.

Animals frequently possess, as part of their instinctive equipment, the power of executing specialised and complex movements for which they are unprepared or quite inadequately prepared by previous practice. In general, these movements are performed in a manner sufficiently definite to be useful from the outset. Thus the first flight of the swallow is "good enough to preserve the little bird from falling to the ground and running the risk of destruction the first time it leaves the nest."[1] The first flight of

[1] Lloyd Morgan in *British Journal of Psychology*, *ibid.*, p. 225.

the sparrow and some other birds approaches still more nearly that of the mature bird.

Now the congenital equipment of human beings, as measured by such ready-made motor aptitude, seems to be very scanty. Walking, for example, has mainly to be acquired by a process of trial and failure; the only rudiment of it which seems to be primary is the tendency to an alternating movement of the legs when the child is held so that his feet touch the ground. Biting an object placed in the mouth, clasping and carrying to the mouth, crawling, the making of articulate sounds, and the expression of emotion by crying, smiling, frowning, etc., are also due to connate dispositions. But this almost exhausts the list of movements which are congenitally definite in human beings so as to be serviceable from the outset in a fashion comparable to the flight of the swallow.

On the other hand, if we consider as a mark of instinct, not congenital aptitudes for executing movements, but congenital dispositions leading to certain appropriate modes of behaviour under certain special conditions, the range of human instinct is much wider. The movements of flight and concealment are, in the main, acquired. But the tendency to perform them in presence of an alarming object is by no means wholly due to learning by experience. "As soon as the little child can run, his fear expresses itself in concealment following on flight; and the many adult persons who seek refuge from the strange noises of dark nights, or from a thunderstorm, by covering their heads with the bed-clothes, and who find a quite irrational comfort in so doing, illustrate the persistence of this tendency." [1]

If, finally, we disregard as unessential original dis-

[1] MacDougall, *Social Psychology*, p. 53.

positions for making definite movements under special conditions, and agree to apply the term "instinct" wherever we find innately specialised interest, attention, and power of learning by experience in certain directions rather than others, it is clear that the instinctive endowment of human beings is far more varied and complex than that of animals. The whole development of human minds has its root in connate tendencies of this sort and is inexplicable apart from them.

This fact is masked and obscured by two conditions. In the first place, what is congenital is modified and transformed by its acquired development to an incomparably greater degree in man than in the lower animals. In the second place, the connate endowment of human beings is far more variable for different individuals.

Perhaps the most striking instances of connate interest and aptitude for learning are to be found in the peculiar gifts of exceptional persons and more especially in those whom we call men of genius. "If Mozart, instead of playing the pianoforte at three years old with wonderfully little practice, had played a tune with no practice at all,"[1] he would have displayed an instinctive capacity analogous to that shown in the first flight of a young sparrow. But his actual performance was due to a specific congenital endowment which we may, if we so choose, call an instinct. Owing to the native bent of his mind he had an absorbing and unflagging interest in music and an altogether exceptional power of rapid, accurate, and tenacious learning by experience in this direction. The like holds for Newton in relation to mathematics, for Darwin in relation to natural history, and for Giotto in relation to drawing. Similar especial endowments, though far less in degree, are

[1] Darwin, *Origin of Species*, p. 188 (Oxford World Classics).

of course very commonly found in more ordinary persons. One boy takes to the study of mathematics like a duck to water, whereas another can scarcely get beyond the multiplication table.

Turning to such tendencies of this type as are broadly characteristic of human beings in general rather than of special individuals, we may consider first those which are mainly confined in their operation to the period of childhood and subserve the acquirement of powers which are the common possession of normal adults. All normal children have to learn, by a more or less prolonged process of active experiment, to stand erect, to walk, to run, to climb, to grasp at an object with definite aim, to throw missiles, and to utter the various articulate sounds used by those about them. They are not prepared for these activities by congenital dispositions yielding definite movements serviceable from the outset. But when the season for their acquisition arises, they show a special interest in them as expressed in continuous attention and persistence with varied effort; they also show special aptitude for learning by experience.

The general innate propensities and capacities which are not limited to childhood but pervade in various degrees the mental life of all or most adults require more accurate examination and analysis than they have yet received. Mr. MacDougall[1] gives the following list:—

(1) Instinctive fears, *e.g.* of darkness and silence and of certain sounds and sights. "Some of us continue all through life to experience a little thrill of fear whenever a dog runs out and barks at our heels, though we may never have received any hurt from an animal and may have perfect confidence that no hurt is likely to be done us."

[1] *Social Psychology*, Chap. III.

(2) Instinctive repulsion, with its characteristic emotion of disgust, *e.g.* the shrinking from slimy creatures. (3) The instinct of pugnacity, with its characteristic emotion of anger. "Many a little boy has, without any example or suggestion, suddenly taken to running with open mouth to bite the person who has angered him. . . . As the child grows up . . . and the means we take to overcome obstructions" become more refined and complex, this instinct ceases to express itself in its crude natural manner, save when most intensely excited, and becomes rather "a source of increased energy of action" whenever we are crossed or thwarted. (4) The instincts of self-abasement and of self-assertion or self-display, with the characteristic emotions of subjection and elation. Under this head come the tendencies to showing off, "putting on side" and bragging, or shyness, bashfulness and shame, which are found in young children as well as in adults. (5) The parental instinct and the tender emotions; this may be taken to include resentment of wrong or injury done to young and helpless creatures. (6) The sexual instinct, including sexual feeling and female coyness. (7) The gregarious instinct, which is important as preparing the way for complex emotions and sentiments connected with social relations. Primarily it seems to consist in a tendency of the individual to seek and cling to the society of his fellows and to feel uneasiness in their absence, and also to treat danger or injury to the "herd" as danger or injury to himself. (8) The acquisitive instinct, leading on to the complex impulses, emotions and sentiments connected with possession. In its primitive form it is analogous to the hoarding impulse shown by many animals, *e.g.* the raven. "Statistical inquiry among large numbers of children has shown that very few attain adult life without having made a collection

of one kind of object or another, usually without any definite purpose."

A glance at this list of congenital propensities shows that, though all are more or less widely diffused, some, such as the sexual, are much more general than others. It shows also that even apart from the influence of experience they differ greatly from individual to individual both in their strength and the special forms they assume. Falling in love, for instance, is instinctive. But we do not all fall in love with the same readiness or the same intensity, or with the same kind of person.

In conclusion, we have to ask whether it is advisable to give the term "instinct" this wide application instead of limiting it to cases in which a connately determined conative tendency is connately linked with appropriate and definite modes of motor activity. There is something to be said on both sides of this question. But in view of the position taken up by recent writers of authority, such as Professor James and Mr. MacDougall, who approach the subject as psychologists rather than as biologists, and also in view of the usage of ordinary language, it seems best to decide in favour of the wider application of the word.

CHAPTER II.

Perceptual Process and Learning by Experience at the Perceptual Level.

§ 1. Perceptual Process contrasted with Trains of Free Ideas.—The general nature of perceptual process has already been fully illustrated in dealing with instinctive actions. It is intelligent, inasmuch as it involves attention, pursuit of ends, appreciation of success and failure, persistency with varied effort, and learning by experience. But perceptual intelligence, in its pure form, is exclusively concerned with the guidance and control of motor activity in relation to an immediately present situation and to its acquired meaning as conveyed by implicit ideas inseparably coalescing with actual sensations. Thus, the perceptual consciousness cannot deal with past, future, and absent objects except in the act of dealing with what is given to it here and now. In the pursuit of ends it is circumscribed by the necessity of always working forward step by step from the actually given situation through a series of others until the goal is reached. It is limited in a way comparable to actual motion; just as in actual motion we cannot transport ourselves from one place to another except by passing through the series of intermediate places, so in perceptual process we cannot transport ourselves in thought into the future except through an intermediate series of presents.

What reference there is to the future is wholly from the

point of view of the actual present. It is involved primarily in the prospective attitude of attention in which the actual present is apprehended as transitional, as something which not merely *is*, but *is to be*. This primary reference to the future is further specialised through experience of results of past activity yielding implicit ideas, which invest what is actually present with acquired meaning.

The train of actions involved in hunting a living prey is shown in the play of the kitten before it has actually hunted, and often without its having had opportunity for learning them by imitation. The kitten will first assume the attitude of watching or lying in wait; it will then steal up to the ball of thread or other object which forms its plaything, in a noiseless snake-like manner; in the next place it gathers itself for a spring, and pounces on the *quasi*-prey, seizes it with teeth and claws, and worries it; finally it lets the object go again, and re-commences the process. The several acts of lying in wait, stealthy approach, crouching for a spring, pouncing on the prey, are phases in the development of the same activity. The same is true of the hunting of an actual prey. In such processes the behaviour of the animal is throughout prompted and guided by actual sense-impressions. But the reaction evoked by each present phase of the developing situation sets body and mind in an attitude of preparation for the next. The whole activity is relative to a series of external conditions which supply in turn occasions for its further development. Now, if these external occasions are to be utilised in an effective manner, the animal cannot remain purely passive in regard to them. On the contrary, it must meet them half-way by watching for them, and by keeping itself in readiness to act in an appropriate way when they occur. Thus perceptual activity is essentially

characterised by attention. Attention is constantly directed towards the external conditions which are relevant to the progress of the action so as to utilise them.

Now attention is always in some manner expectant or prospective. So far as we already know a thing sufficiently for our purpose, the work of attention is already accomplished. The direction of thought, whether perceptual or ideational, coincides with the direction of conation—of appetency or aversion; conation is always pressing forward towards its end; hence attention, which is nothing but conation defining itself in cognition, and so guiding itself by means of cognition, must also constantly be directed forward beyond the "ignorant present," to meet what is to come. To attend is always to *watch*, to *await*, to be on the *alert*. When we take a light to lighten our path through a dark place, we use it to make out whither we are going, not where we have already arrived. It is to guide our future steps, not the steps we have already taken. Now if we care to use a bold metaphor, we may say that attention is the light used by conation to make out its path. Only we must remember that attention is no external illumination, but is simply identical with conation considered in its cognitive aspect. Trains of perceptual activity are marked throughout their course by this mental prospectiveness. Its external sign is the pre-adaptation of the sense-organs to receive impressions, and the pre-adjustment of the body in readiness to act when the opportunity presents itself.

The special forms assumed by adaptive behaviour of this kind may be more or less completely determined by instinctive endowment. But in the higher animals and, above all, in human beings, they are to a large extent acquired through experience. Now, so long as the operative ideas remain implicit, involving only primary acquirement

and revival of meaning and complication, this does not alter the fundamental nature of the perceptual process. Thought is still directly embodied in motor activity and confined to the point of view determined for it by the actual sense-experience of the moment. Indeed, the perceptual processes of human beings have in the main been acquired without any definite basis in special instincts giving rise to specialised modes of behaviour from the outset.

A man climbing a precipitous cliff may have his attention fully occupied in gaining and retaining foothold and handhold. His activities mainly consist in muscular movement guided by sense-perception. Such an act as threading a needle does not necessarily involve free ideas; attention is fully occupied in the guidance of the hand, and the delicate co-ordination of its movements by the aid of the eye. The same holds broadly true of such performances as walking on a tight-rope, keeping one's balance on a bicycle so far as it may require attention, and, in general, of games of bodily skill. In these instances, perceptions are not isolated facts; they form series having a certain unity and continuity similar to that of trains of ideas or trains of thought. Any such series constitutes a single complex perceptual process. It differs from a train of ideas inasmuch as the sequence of its parts does not merely depend on mental conditions such as retentiveness and association. The sequence of its parts depends also upon the sequence of sense-impressions due to the combined effect of external conditions and the motor activity of the subject; inasmuch as it depends on motor activity, it is under subjective control.

Trains of free ideas are not, in this way, bound up with bodily behaviour in relation to a given situation and so confined to the point of view fixed by actual sense-

experience. Thought which takes shape in a sequence of explicit ideas conditioned by a sequence of mental images can expatiate freely in the domain of the past, the future, the absent and the merely possible, in detachment from the circumstances of the immediate present. We may, for instance, while sitting at a desk in London, ideally represent ourselves as on a bicycling tour in Brittany, and we may fix beforehand what places we are going to visit and anticipate what we shall see and do in them; we may even imagine ourselves in the moon and bring before us in idea series of possible adventures there.

One consequence of this power of ideally transporting ourselves into the regions of the past, the future, the spatially remote and the merely possible is that, in the pursuit of ends, we are not bound, so to speak, to live from hand to mouth. We are able mentally to cross a bridge before we come to it. We can deal ideally with future exigencies so as to form a plan of action before proceeding to put it in execution. Further, in so doing we are not compelled to work forward step by step from the actually present situation. We may, on the contrary, begin at the end and move backwards to the point at which the actual execution of the plan must start. If the desired result is d, and the consecutive steps required for its attainment are a, b, c, we may begin with d, then pass backward first to c, then to b, then to a.

Another most important point of difference between perceptual process and trains of ideas is that on the perceptual level there are no explicit concepts. By this I mean that there is no apprehension of the general or universal as such in distinction from particular cases or instances. There is no awareness, for instance, of the class "men" or "horses," as a separate object of thought discriminated from this or that particular man or particular horse; still

less are there distinct objects corresponding to the meaning of abstract terms, such as "human nature" or "equine nature." This must not be taken to imply that at the perceptual level there is no awareness at all of the general or universal. In that case, there could be no such thing as recognition or identification. But a dog, of course, recognises a bone or another dog when he sees it. Indeed, continuity of attention is possible only on condition that an object is recognised as the same in different stages and phases of its appearance to consciousness.

The fact is that recognition in its more primitive forms does not require discrimination of the universal from the particular, but only a confused or implicit awareness in which the universal is not separately apprehended as a distinct object of thought. Thus, when in taking my bath in the morning I recognize sponge and towel, each in its distinctive character, I do not usually think of the class "sponges" as such, or of the class "towels" as such, in contrast to the particular perceived members of these classes, so as to formulate the judgments, "this is a sponge" or "this is a towel." My awareness of the general nature of sponges or of towels is, so to speak, embedded in my awareness of the particular sponge or towel and not mentally marked off from this. Thus, though there is a rudimentary judgment of recognition inasmuch as the universal nature of the particular is confusedly apprehended, yet there is no judgment in which subject and predicate are mentally sundered from each other. Still less are judgments possible at the perceptual level in which one general term is subject and another predicate, *e.g.* "sponges are soft," or "horses are quadrupeds."

Comparison at the perceptual level can exist only in a rudimentary form. At the utmost it is confined to a vague apprehension of likeness and difference. It is only in

conceptual thought, which is aware of general features, as such, that attention can be directed to the discovery of the special points in which two objects are alike as contrasted with those in which they differ.

Imitation is limited in the same way. In merely perceptual consciousness attention to an action performed by another produces a tendency to similar behaviour, where the conditions are otherwise favourable. But deliberate or inferential imitation, in which *A* copies the act performed by another, *B*, because he expressly recognises that *B*'s behaviour has led to a certain result which he now desires, depends upon trains of free ideas and the conception of universals, as such, in distinction from particular cases. A child may, through a merely perceptual process, tap a spoon against a tray because he has seen me doing this; he may then be induced to go on repeating the action by the pleasure he finds in it; further, if such spontaneous imitation of a certain person under certain conditions generally yields agreeable results, the general tendency to imitate this person or to imitate under these conditions will be strengthened and may even become habitual. But, apart from free ideas, he will not take a key to open a drawer and get sweetmeats because, through previous observation of my conduct, he has learned expressly to recognise this mode of procedure as supplying means to the desired end.

Finally, there is for perceptual consciousness no discrimination of alternative possibilities so as to bring them severally before the mind in their distinction from each other. A dog may hesitate when it is at fault in following up a trail, and it may pause in an attitude of attention until something occurs to decide it to take one turn rather than others. But we have no reason to suppose that anything goes on in its mind resembling what would be

expressed by saying: "If this turn, what will follow? if, instead, this other, what will follow?" It is only through trains of free ideas that the mind can follow out possible lines of behaviour or possible series of events.

With this is connected a very important limitation of perceptual process on its productive or constructive side. As the merely perceptual consciousness cannot bring before itself alternative possibilities at all, *a fortiori* it cannot bring before it possibilities which are relatively new in so far as they have no counterpart in previous experience or are even contrasted with what has actually happened. The pig does not imagine itself flying like a bird, and we cannot suppose "a dog regretting, like one of Punch's heroes, that he did not have another slice of mutton."[1] At the perceptual level there is nothing of the nature of what we shall hereafter refer to as ideal construction. Perceptual process has, indeed, a productive or constructive aspect. But this consists in the intelligent variation of motor activity in response to relatively novel conditions, which is most clearly seen in persistency with varied effort.

I have dwelt mainly on the defects of perceptual intelligence as compared with the flow of free ideas. But against these we must set two advantages. It is only in perception that the mind apprehends what actually exists at the moment in which it actually exists. Further, it is only through the motor activity of perceptual process that we can act on things so as to alter them and adapt them to our needs and purposes.

§ 2. Primary Retentiveness at the Perceptual Level.—In order to understand how learning by experience is operative at the perceptual level we must never forget that it ultimately depends on primary retentiveness. It takes

[1] Ward, *op. cit.*

place during the primary occurrence of perceptual activity, though its full result is manifested only on repetition under similar conditions. During the original process previous stages leave behind them a persisting cumulative disposition determining subsequent stages, and it is this disposition as a whole which becomes operative when the process is again enacted on another occasion. Thus, even in the course of the same train of action, the various features of the total situation have acquired meaning due to continuity of attention and primary retentiveness which they would not otherwise possess.

There is one instance of this which is especially instructive—that in which a perceived object disappears for a time and is none the less apprehended as having a continued existence. Examination of our own experience shows that this awareness of continued existence does not necessarily presuppose free explicit ideas such as would be conditioned by separable images. If I am pursuing a man at full speed, and see him turn a corner, I do not need, in order to continue the chase, to keep before my mind a separate mental image of the man as running on the other side of the corner. On the contrary, it is enough for me to keep my eye on the corner and make for that. At this special stage in the development of my activity, the sight of the corner is sufficient for its guidance. In general, actual searching does not necessarily presuppose explicit ideas. Free ideas become indispensable only when the place and manner of search have to be fixed beforehand by something in the nature of a preliminary plan of procedure. In animals such ideal preparation for future action seems to be exceptional, if indeed it occurs at all.

There are, however, abundant and striking examples of animals treating an object as still continuing to exist, though it is out of the range of perception. Under this

head come the frequent cases of approaching prey behind a cover which conceals it. The following example, given by Schneider,[1] is typical. A sand-hopper was creeping towards some sea-weed. A crab was watching it and slowly approaching it. Between them was a clump of sea-weed, and the crab availed itself of this as cover. When within about eight inches of its prey, it left its hiding-place, crouched, and crept towards its victim; when the crab was about four inches off, the sand-hopper turned towards its pursuer. Immediately the crab vanished. The next moment the sand rose in the neighbourhood of the sand-hopper and the crab emerged. On its reappearance, it made one or two stealthy steps forward and then pounced on its prey. The conditions of crab-life forbid us to ascribe this behaviour to previous learning by experience of results. We must account for it by highly specialised and definite instinct together with primary retentiveness.

Darwin gives the following instance of looking for a prey which has disappeared.[2] A wasp made a sudden dash at a spider and then flew away; "the spider was evidently wounded, for, trying to escape, it rolled down a little slope, but had still strength sufficient to crawl into a thick tuft of grass. The wasp soon returned and seemed surprised. It then commenced as regular a hunt as ever hound did after fox, making short semicircular casts. The spider, though well concealed, was soon discovered."

For the higher animals, examples are too familiar to need special quotation. All that is required by way of explanation is the assumption that "the perception of the prey maintains its influence after it is past" so as to "cause

[1] *Op. cit.*, p. 324.

[2] *Voyage of the "Beagle,"* Chap. II., p. 34.

the same sort of effort to get at the victim as would be put forward were the victim still in sight."[1] In other words, what is required is primary retentiveness, not previous experience of results, still less explicit ideas.

§ 3. **Learning by Experience of Results.**—Learning by experience of results at the perceptual level is shown both in the gradual modification of instinctive behaviour, and also in action for which there is no special instinctive equipment. We have already given examples of the first kind. The way in which the more artificial performances of animals are acquired is best investigated in experiments appropriately arranged so as to exhibit the process of learning in its successive stages. Researches of this nature were first effectively carried out by Mr. Thorndike on dogs, cats, and chicks,[2] and his observations have been in the main confirmed by the work of a number of subsequent inquirers. The general method is to place an animal "under the influence of some stimulus which it strives either to get rid of or to get more of": the animal then goes through a series of reactions until one proves successful; *on being after an interval of time placed in the same situation, the unsuccessful movements are fewer, and further repetition causes them to be dropped entirely.*[3]

Mr. Thorndike's aim was to discover the process by which animals learn such actions as opening doors by depressing or lifting latches. "The method was to put the animals when hungry in enclosures from which they could escape (and so obtain food) by operating some simple mechanism, *e.g.* by turning a wooden button that held the door, pulling a loop attached to the bolt, or pressing down

[1] Hobhouse, *Mind in Evolution*, p. 96.
[2] The best results were obtained for the cats.
[3] Miss Washburn, *The Animal Mind*, p. 219.

a lever. Thus one readily sees what sort of things the animals can learn to do and just how they learn to do them. Not only were the actions of the animals in effecting escape observed, but also in every case an accurate record was kept of the times taken to escape in the successive trials. The first time that a cat is put into such an enclosure, some minutes generally elapse before its instinctive struggles hit upon the proper movement, while after enough trials it will make the right movement immediately upon being put into the box. The time records [plotted down in curves] show exactly the method and the rate of progress from the former to the latter condition of affairs. . . . What happens in all cases is this: The animal on being put into the box, and so confronted with the situation 'confinement with food outside,' bursts forth into the instinctive activities which have in the course of nature been connected with such a situation. It tries to squeeze through any openings, claws and bites at the walls confining it, puts it paws through and claws at things outside, trying to pull itself out. It may rush around, doing all this with extraordinary vehemence and persistence. If these impulsive activities fail to include any movement which succeeds in opening the door, the animal finally stops them and remains quietly in the box. If in their course the animal does accidentally work the mechanism (claw the button round, for instance), and thus win freedom and food, the resulting pleasure will stamp in the act, and when again put in the box the animal will be likely to do it sooner. This continues; all the squeezings and bitings and clawings which do not hit the vital point of the mechanism, and so do not result in any pleasure, get stamped out, while the particular impulse, which made the successful clawing or biting, gets stamped in, until finally it alone is connected with the sense-impression of

the box's interior, and it is done at once when the animal is shut in."[1]

Thorndike, in interpreting his results, takes no account of implicit ideas; hence he is led to the conclusion that his cats, dogs and chicks did not show by their behaviour that they possessed ideas at all. If this be taken to apply only to explicit and free ideas, Thorndike's view seems to be justified by the facts. Evidence for it is to be found: (1) In the general mode of behaviour of the animals as maintained throughout the process of learning; this was in principle the same when the cat or dog had been repeatedly shut up within the same enclosure as it was when it was first placed there. It consisted in an outburst of diffused motor activity, without any sign of thinking over the situation, so as to make ideal preparation for dealing with it by laying out a plan of action before proceeding to put it into execution. The learning took place by a gradual discontinuance of abortive actions and persistence in those which led to success. Even those which were only relatively successful would be proportionately favoured; *e.g.* there would be more persistence in pushing or pulling a loose bar of the cage than one which was quite unyielding. Now in all this there is no symptom of other mental processes than such continuity of attention, persistence with varied effort, appreciation of relative success and failure, and acquirement and reproduction of primary meaning as may be found at the purely perceptual level. (2) In the gradual way in which in many cases the time required for the animal to escape decreased.[2]

[1] *Science*, new series, vol. vii., No. 181 (June 17, 1898), pp. 818, 820-821; an abstract of the original paper in Monograph Supplement, No. 8, of the *Psychological Review*.

[2] "Thus the successive times taken by one cat in a certain box were (in seconds) 160, 30, 90, 60, 15, 28, 20, 30, 22, 11, 15, 20, 12,

Of course when the decrease is not gradual but relatively sudden, as it was in some of the experiments, this does not prove free ideal preparation. But where it is found to be gradual we are justified in regarding this as affording a strong presumption on the other side. "A human being who had once hit upon the right way to open a lock could hardly fail on being confronted with it a second time, at not too great an interval, to recall an idea of the successful movement and perform it at once, without any unnecessary accompanying movements."[1]

The general result of these experiments is confirmed by others which show the absence of the power of learning by deliberate imitation. Thorndike found that cats which had failed previously to find their way out of a cage did not learn the way out, and were not at all helped in doing so, when they were placed in a suitable position for watching, even repeatedly, the behaviour of a cat which knew how to get out. A later series of experiments with monkeys yielded, in the main, a similar result. Thorndike also found that his animals failed to profit by being "put through" even the simplest acts by the experimenter, *e.g.* by having a paw placed in a loop and passively made to pull it down. He infers that they were destitute of the power of learning in any way by imitation or by being put through an act. This, however, is a too hasty and sweeping conclusion. As he himself points out, the animals, under the conditions of his experiment, did not even *attend* in an appropriate way. They were given full

10, 14, 8, 8, 5, 10, 8, 6, 6, 7." The animals "would, in the case of some difficult associations, happen to do the thing six or seven times, but after long periods of promiscuous scrabbling, and then forever after would fail to do it." (*Psychological Review*, vol. v., No. 5, p. 552.)

[1] Washburn, *op. cit.*, p. 237.

opportunity to watch how others escaped, but they did not watch them at all. This is, indeed, of itself strong evidence of the absence of the power of deliberate or inferential imitation, in which "an animal, watching another go through an action and observing the consequences, is led to perform a similar act from a desire to bring about a similar result."[1] If Thorndike's animals had been capable of this kind of imitation, they would have attended to the way in which others escaped, instead of totally disregarding this and occupying themselves with other matters.

But it does not follow that they would not imitate spontaneously, could their attention be fixed in the right direction, otherwise than through a desire of discovering a means of escape. In this respect, a very interesting series of experiments carried out by Mr. Hobhouse forms a valuable supplement to Thorndike's. "Essentially, each experiment consisted in setting the animal the task of obtaining food by some method presumably strange to it. For example, food was put into a box, which was then shut, and left for the animal to open. . . . The animal was first allowed time to discover the method of obtaining it for itself. If after a little while it showed no sign of hitting on the right method, it was shown, and allowed to get the food. Fresh food was then placed as before, and a new trial began."[2]

Two points emerge clearly from the whole course of these investigations. The first is that, in order that an animal should be influenced at all by being shown, it was necessary to secure its continued attention. The second is that the animals were not initially prepared to attend to Mr. Hobhouse's actions through interest in discovering a means to the desired end which they might subsequently

[1] Washburn, *op. cit.*, p. 238.
[2] Hobhouse, *Mind in Evolution*, p. 153.

employ for themselves. Their attention had to be otherwise evoked. "A mere mechanical performance of the act before the animal, which it may or may not see, has no effect whatever." In every case "the animal is taken up, on the one hand with its desire for food, on the other with its own instinctive or habitual method of dealing with the obstacle before it. One's dog will momentarily attend out of politeness to his master, but a cat is moved by no such considerations, nor is an elephant nor a monkey."

So far, however, as Mr. Hobhouse did succeed in attracting the attention of the animals to his own actions, he found that they unmistakably profited by being shown how to do things. But how? In general, the results may be sufficiently accounted for, at least in the main, without assuming anything in the nature of deliberate as distinguished from spontaneous imitation. In part, the animals in watching Mr. Hobhouse had their attention directed especially to the vital point of the mechanism, so that when left to themselves they would tend to pick out this as the object of their efforts. This result could be secured by mere pointing, if the animal attentively followed the pointing hand; and it can then scarcely be said to involve imitation at all. But besides this the animals were also led more or less to reproduce Mr. Hobhouse's mode of action, pushing, for instance, where he pushed, and pulling where he pulled. In focussing attention on his doings they acquired a tendency to act in a similar way themselves, and this tendency became operative, when they were left to themselves, as a condition determining the preference of one line of behaviour rather than others.

It should also be noted that, as the general line of behaviour consisting in attention to the experimenter and following his lead repeatedly brings about satisfactory

results, it will gradually be confirmed by success and pass into a more or less confirmed habit. The growth of a general disposition to attend and imitate is clearly discernible in the course of Mr. Hobhouse's experiments.[1]

The actions of animals under the conditions of these and similar experiments are, in the main, to be explained as due merely to perceptual intelligence, without trains of free ideas. The whole drift of the evidence forbids us to assume the presence of deliberate comparison directed to discovering and noting the points in which various modes of procedure agree and differ so as to ascertain precisely what it is that makes one way of dealing with a difficulty right and others wrong. Deliberate imitation, as we have just seen, is also excluded. The facts are equally incompatible with the existence of explicit inference such as involves the apprehension of general propositions as such, and their application to particular cases. There is no ground for doubting that causal inference of a rudimentary kind is shown in the appreciation of success and failure, in persistency with varied effort, in the repetition of ways of behaviour which have yielded satisfactory results in the past to the exclusion of others, and also generally in the anticipation of like results when like conditions occur. But there is nothing to indicate that the animals apprehend general rules of causal connection, as such, in contrast to their particular applications. This is not, however, to be taken to exclude all insight into the reason why a certain consequence should follow from a certain condition. A dog pulling a piece of string with a piece of meat tied to the other end will understand that the meat will follow

[1] Mr. Hobhouse seems inclined to favour or at any rate not to exclude the hypothesis of deliberate imitation. Without denying that this may occur in the higher animals, I am convinced that the facts in general do not require or admit of this explanation.

the motion of the string, just as a man would understand. Inference from a general proposition to the particular instance is required neither in the case of the man nor in that of the dog.

It will help to make clear the nature of perceptual intelligence, if we consider briefly a theory of the way animals learn by experience which has been put forward by Mr. Thorndike, who, in his eagerness to reject the operation of free ideas, has run to the opposite extreme and almost denied the presence of intelligence altogether. He assumes, indeed, that the animal begins with conation and attention to its situation. But he holds that the only result of learning by experience is to supplant this original intelligence by purely unintelligent motor associations such that when a certain sense-impression occurs a certain group of muscles is innervated in a certain way. He thus leaves no place for such factors as acquirement and revival of meaning. He even goes so far as to deny to the animal all anticipation of the experiences which will accompany the movement itself, *e.g.* those due to muscle, joint and tendon sensations, or to the sight of the moving limb. These, in his view, are experienced only when they come; they are in no way referred to beforehand.

The whole position seems quite untenable. Mr. Hobhouse has forcibly urged against it the fact that what the animals acquire through experience is not merely a tendency to execute a certain movement on the occurrence of a certain sense-experience, but rather the tendency to bring about a certain perceptible effect by whatever means is in their power. A cat, for instance, which has learned to escape from confinement by pulling a loop down with its paws, may on the next occasion use its teeth instead of its paws. If the loop has been raised it may climb or jump

up before pulling. If it fails in one way it may try another.

In the second place, the processes in human beings which Mr. Thorndike himself adduces as being of a similar nature do not at all conform to this account of them. "The tennis player," he urges, "does not feel 'This ball coming at this angle and with this speed is similar in angle but not in speed to that other ball of an hour ago, therefore I will hit it in a similar way.' He simply feels an impulse from the sense-impression. . . . No tennis player's stream of thought is filled with free-floating representations of any of the tens of thousands of sense-impressions of movements he has seen and made in the tennis court. Yet there is consciousness enough at the time, keen consciousness of the sense-impressions, impulses, feelings of one's bodily acts. So with animals. There is consciousness enough, but of this kind."[1] This is an excellent example of perceptual activity developed through experience, and the results of learning by experience in animals are, no doubt, essentially similar. But can we reduce what the tennis player has acquired by experience to mere associations between certain impressions and certain movements? Obviously not. Mr. Thorndike's analysis may hold good for cases in which motor processes have been so fixed and organised through frequent repetition under uniformly recurrent conditions as to become automatic, so that they can take place independently of attention. But the tennis player cannot go on playing while his mind is engrossed in other subjects. On the contrary his attention must be constantly on the alert to discern the acquired meaning of his sense-impressions and of their relatively novel variations so as to pre-adjust his actions accordingly.

[1] Thorndike, *Psychological Review*, Mon. Supplement, No. 8, p. 84

Finally, Mr. Thorndike himself notes a difficulty in his explanation for which he finds no solution. This is connected with the question: How does the pleasure of success "stamp in" certain modes of behaviour and the disagreeableness of failure "stamp out" others? On his view, of course, the only condition of the motor associations being formed is that the movement should occur together with the sense-impression or in close succession to it. This condition being fulfilled, the only function of success and failure is to strengthen or weaken the association thus generated. But, as Mr. Thorndike points out, the satisfaction of success arises only in the last stage of the whole process, when the animal emerges from its cage and enjoys food and freedom in the open air. How, then, can it work backwards, over what is sometimes a considerable interval, so as to reinforce motor associations acquired at an earlier stage while the animal was still grappling with its problem inside the enclosure? Mr. Thorndike, as I have said, regards this as a real and serious difficulty. But it is no difficulty to us. The unity and continuity of interest which binds a sequence of distinct acts into a single action has its counterpart on the side of retentiveness in the formation of a cumulative disposition. On the first occurrence of the process the traces left by prior phases persist in and contribute to determine succeeding phases. They unite in a single cumulative disposition. When the activity is repeated, whatever stimulus prompts it re-excites the total cumulative disposition left behind by its previous occurrence. The cumulative disposition has been modified in the anterior experience, and accordingly the re-aroused activity takes a correspondingly modified course as a whole. This is the process which we have described as *revival of acquired meaning*. Without this there can be no learning by past

experience; and intelligent learning by experience may be due to it alone.

§ 4. **Reproduction in Perceptual Process.**—In purely perceptual process, the only forms of reproduction are (1) *Revival of acquired meaning*, (2) *Complication*, and (3) *The revival of general states of nervous excitement and their concomitant organic sensations.*

(1) *Revival of acquired meaning* is the most primary and essential. It is grounded in the very nature of perceptual process considered as appetitive activity. The whole process, in so far as it is one and continuous, leaves behind it a cumulative disposition. Hence, when it is repeated, it is modified as a whole from the outset.

(2) *Complication* is a process for which there are probably special pre-arrangements in the original constitution of the nervous system. It consists in modification of the quality and increase of the complexity of certain sensations by association with other kinds of sensation in past experience. It mainly takes place between sensations belonging to different senses such as sight and touch. In looking at a hard object, our visual experience is different from that which we have in looking at a soft object, and the difference is due to the corresponding tactile experiences.

(3) *The revival of general states of nervous excitement and their concomitant organic sensations* is of especial importance in connection with emotion. A dog which has been whipped will whine and display signs of fear and distress at the sight of the lash. The original pain-sensations produced a diffused nervous excitement, which gave rise to a general disturbance of organic functions, and to organic sensations. The sight of the whip revives an analogous nervous and bodily excitement and with it analogous experiences.

§ 5. Explicit Ideas accompanying Perceptual Process.— So far we have treated of perception and perceptual process in its pure form. We have distinguished it sharply from explicit ideas. But in the actual mental life of man the two run into one another, so that we do not usually find pure perceptual processes, but rather what we may call perceptual processes not absolutely, but only *a potiori.* The same is true to some extent of the higher animals also. Explicit ideas may accompany a process without interfering with its fundamentally perceptual nature. The explicit ideas may fulfil a function essentially analogous to that fulfilled by perception, and not any function which by its very nature requires the presence of such ideas. This happens when the only office discharged by significant mental imagery is to prompt or guide the execution of an action, and not to lay out the plan of an action beforehand in the form of a train of thought. The operative ideas are then explicit but still tied. They are not set free to form a train of thought independent of perception. Independently of previous experience squirrels gnaw at nuts, and by reaching their contents satisfy their congenital craving without any mental image of the kernel inside. Suppose that on a future occasion they start with this mental image, the character of the process is not essentially altered. The image of the kernel inside now only contributes to prompt and guide the action, just as the mere perception of the nut prompted and guided it before. Separate images may be especially useful and even necessary in this way, when the activity is comparatively complicated, and undetermined by definite congenital impulses. Take for instance the case of a monkey imitating a train of actions which it has seen performed by a man— those concerned in shaving, for instance. Possibly percepts would alone suffice in such a case. The sight of the

razor might prompt the act of sharpening it, and the act of sharpening it might next prompt the lathering, and so on. But certainly it is easier to understand the action if we suppose that in different phases of its progress some mental image of the behaviour of the man arises in the mind of the monkey, and helps to guide him.

It would seem that in animals explicit ideas, so far as they exist[1] at all, are isolated and, so to speak, sporadic. They do not as a rule give rise to further ideas following each other in a train. Their function is rather to guide the development of motor activity as percepts guide it.

In our own mental life, free ideas are almost constantly present, so that purely perceptual activity is comparatively exceptional. But it certainly takes place. If I have once been bitten by a dog, and meet the same dog on another occasion, I do not need to summon up in my mind a mental image of being bitten again in order to take practical measures of an intelligent kind.

The vast interval which separates human achievements, so far as they depend on human intelligence, from animal achievements, so far as they depend on animal intelligence, is connected with the distinction between perceptual and ideational process. Animal activities are, in the main, either purely perceptual, or, in so far as they involve ideas, these ideas only serve to prompt and guide an action in its actual execution.[2] On the other hand, man constructs "in his head," by means of trains of ideas, schemes of action before he begins to carry them out. He is thus

[1] There is room for difference of opinion on this point. Personally, I do not think that there is much evidence for the presence of ideal images in the animal mind, except in the case of the more intelligent monkeys and perhaps of elephants.

[2] There may be exceptions to this rule, but the general statement is broadly true.

capable of overcoming difficulties in advance. He can cross a bridge ideally before he comes to it actually.

§ 6. **Impulsive Character of Perceptual Process.**—Any single train of perceptual activity has internal unity and continuity. But where conscious life is mainly perceptual, the several trains of activity are relatively isolated and disconnected with each other. They do not unite to form a continuous system, such as is implied in the conception of a person. We must deny personality to animals. They are in the main creatures of impulse. The word *impulse* is properly applied to any conative tendency, so far as it operates by its own isolated intensity, apart from its relation to a general system of motives. Action on impulse is thus contrasted with action which results from reflexion or deliberation. In deliberation a man, instead of following out the impulse arising from the circumstances of the present moment, brings the contemplated course of action into relation with the total system of his mental life, past and future. He appeals from the Self of the present moment to the total Self. If the strength of the momentary impulse determine action without giving time for deliberation, regret or remorse is likely to follow. When the momentary impulse has ceased to dominate consciousness, the idea of his past action may come into conflict with the more general tendencies which give unity and consistency to his life as a whole. Regret or remorse of this kind is impossible on the purely perceptual plane; simply because on the perceptual plane there is no unified system of tendencies with which the isolated impulse could collide; there is no personal Self including in one whole past, present and future experience. It is futile to punish a dog for an action which he did a week ago. Thus the purely perceptual consciousness is compact of relatively detached impulses. The end attained in one perceptual

process does not constitute a step towards the attainment of further ends. The several processes, each having it own internal unity and continuity, are disconnected with each other much as games are disconnected with each other. We do not assume the result of one game at chess or rubber at whist as the starting-point of the succeeding game. Each game starts completely afresh on its own account. It is true that the skill of the player is increased by practice, but this also holds good of trains of perceptual activity, and makes the analogy more perfect. Summing up, we may say that on the perceptual plane there is no single continuous Self contrasted with a single continuous world. The concept of the Self as a whole, uniting present, past and future phases, and of the world as a single coherent system of things and processes, are ideal constructions, built up gradually in the course of human development. The ideal construction of Self and of the world is comparatively rudimentary in the lower races of mankind, and it never can be complete. On the purely perceptual plane it has not even begun.

CHAPTER III.

IMITATION.

§ 1. **Introductory.**—Imitation is a process of very great importance for the development of mental life in both men and animals. In its more complex forms, it pre-supposes trains of ideas; but in its essential features it is present and operative at the perceptual level. It is largely through imitation that the results of the experience of one generation are transmitted to the next, so as to form the basis for further development. Where trains of ideas play a relatively unimportant part, as in the case of animals, imitation may be said to be the sole form of social tradition. In the case of human beings, the thought of past generations is embodied in language, institutions, machinery, and the like. This distinctively human tradition pre-supposes trains of ideas in past generations, which so mould the environment of a new generation, that in apprehending and adapting itself to this environment it must re-think the old trains of thought. Tradition of this kind is not found in animal life, because the animal mind does not proceed by way of trains of ideas. None the less, the more intelligent animals depend largely on tradition. This tradition consists essentially in imitation by the young of the actions of their parents, or of other members of the community in which they are born. The same directly imitative process, though it is very far from forming the whole of social tradition in human beings, forms a very important part of it.

§ **2. The Imitative Impulse.**—We must distinguish between ability to imitate and impulse to imitate. We may be already fully able to perform an action, and the sight of it as performed by another may merely prompt us to reproduce it. But the sight of an act performed by another may also have an educational influence; it may not only stimulate us to do what we are already able to do without its aid; it may also enable us to do what we could not do without having an example to follow. When one man sees others dancing, his own feet may become restless and he may be carried away by the impulse to join them. But he may not have anything to *learn* from them. He may be a better dancer than any of them to begin with. He is simply prompted to do on this particular occasion what he is already quite capable of doing. The case is different with the child's early imitation of the words spoken by his elders. The result at first very imperfectly corresponds to the model, and success is attained only by repeated trials. In very many instances there is learning by imitation with little or no direct impulse to imitate. The imitative process is enacted not for its own sake but for the sake of some ulterior end. Thus if I am learning billiards and someone shows me by his own example how to make a particular stroke, the case is different. It is not his example which in the first instance prompts me to the action. He merely shows the way to do what I already desire to do.[1]

We have then first to discuss the nature of the imitative impulse—the impulse to perform an action which arises from the perception of it as performed by another.

This impulse is an affair of attentive consciousness. As

[1] So far as this is capable of being taught, and does not depend on "practice."

such it must be distinguished from merely automatic imitation. Automatic imitation is of two kinds. It may be due to habitual association as when the cough of one man sets another coughing. Or again it may be due to the general habit of doing as others do when there is no special motive to the contrary. This habit is constantly operative in human society. It seems to have manifold sources. I may here mention three. (1) It is easier simply to follow the current mode of procedure than to be continually striking out new lines of action for ourselves. Thus the habit of following suit constitutes an enormous economy of time and trouble. (2) It is generally disagreeable to attract attention by singularity and to disturb others by aimless novelty. (3) We learn by experience that what others do is very often based on good reason, and that deviation from it is likely to be disadvantageous. Such conditions as these lead men to form the settled habit of doing as others do, where they feel no special interest in attending to a matter for themselves and forming an independent judgment.

The imitative impulse in distinction from such mere routine repetition is a conation which seeks satisfaction in the imitative process itself. The perception of an action prompts us to reproduce it when and so far as it excites interest or is at least intimately connected with what does excite interest. Further, the interest must be of such a nature that it is more fully gratified by partially or wholly repeating the interesting action. Thus imitation is a special development of attention. Attention is always striving after a more vivid, more definite, and more complete apprehension of its object. Imitation is a way in which this endeavour may gratify itself when the interest in the object is of a certain kind. It is obvious that we do not try to imitate all manner of actions without distinction,

merely because they take place under our eyes. What is familiar and commonplace, or what for any other reason is unexciting and insipid, fails to stir us to re-enact it. It is otherwise with what is strikingly novel or in any way impressive, so that our attention dwells on it with relish or fascination. It is of course not true that whatever act fixes attention prompts to imitation. This is only the case where imitation helps attention, where it is in fact a special development of attention. This is so when interest is directly concentrated on the activity itself for its own sake rather than for the sake of its possible consequences and the like ulterior motives. But it is not necessary that the act in itself should be interesting; in a most important class of cases the interest centres not directly in the external act imitated, but in something else with which this act is so intimately connected as virtually to form a part of it. Thus there is a tendency not only to imitate interesting acts, but also the acts of interesting persons. Dogs often imitate their masters. Men are apt to imitate the gestures and modes of speech of those who excite their admiration or affection or some other personal interest. Children imitate their parents, or their leaders in the playground. Even the mannerisms and tricks of speech of a great man are often unconsciously copied by those who regard him as a hero. In such instances the primary interest is in the whole personality of the model; but this is more vividly and distinctly brought before consciousness by reproducing his external peculiarities.[1]

Our result then is that interest in an action prompts to imitation in proportion to its intensity, provided the interest is of a kind which will be gratified or sustained

[1] Of course the society in which we live is always interesting to us. Hence the tendency to acquire a provincial accent when we are constantly associating with people who have it.

by imitative activity. But here we must make a distinction. The interest may be either primary or acquired through previous experience. The imitative impulse in young animals and children is to a large extent independent of previous experience. It depends on congenital tendencies. A young duck brought up by a hen among chickens imitates its social environment only in a limited degree. Where there is an instinctive tendency towards a certain form of action, the action is interesting when another performs it, so that the imitative impulse comes into play.

As a rule, this instinctive imitation not only prompts the action, but also determines more or less its special character. The child has a congenital tendency to utter articulate sounds; but the special character of the sounds it utters is largely determined by the sounds it hears from the persons who surround it. The same is true of the song of birds. But sometimes imitation seems only to supply an occasional impulse, and does not in the first instance create the power of performing an action or appreciably modify its character. As an example in which the presence of a model simply stimulates an activity and does not modify it, we may take the repetition of a danger-cry by young birds when they hear others utter it. The danger-cry itself is undoubtedly instinctive. Any disagreeable or disturbing experience will elicit it from a young chicken which has not heard it before. Its effect also on the birds who hear it is instinctive. When a parent bird utters the cry, a chick which is yet in the egg may suddenly cease in its endeavour to pierce the shell and become motionless. In just the same instinctive way, the sound of the alarm-note uttered by one bird prompts another to repeat it, so that the alarm may be communicated to a whole group. It is mainly in this manner that

birds and other animals learn to avoid dangers which at first they had disregarded. The sight of a man with a gun on a previously desert island may evoke no alarm in its feathered inhabitants; but after a few experiences of the fatal consequences connected with a man so armed, the birds in general will become shy. Those who have actually been disturbed or wounded by the gun have uttered the alarm-note; this has thrown yet others into a state of alarm, and they also utter the alarm-note; these, when they again see a man, utter the alarm-note, although they have never experienced any harm from human beings.

§ 3. **Learning by Imitation.**—Let us now turn to the other side of the question. Let us consider the case in which the power of performing an action is acquired in and by the process of imitation itself. Here there is a general rule which is obvious when once it is pointed out. It is part of the still more general rule that "to him that hath shall be given." Our power of imitating the activity of another is proportioned to our pre-existing power of performing the same general kind of action independently.[1] For instance, one who is devoid of musical faculty has practically no power of imitating the violin playing of a Joachim. Imitation may develop and improve a power which already exists, but it cannot create it. Consider the child beginning for the first time to write in a copybook. He learns by imitation; but it is only because he has already some rudimentary ability to make simple figures that the imitative process can get a start. At the outset, his performance is very unlike the model set before him.

[1] Mr. Thorndike's animals, referred to in the previous chapter, failed to imitate actions so strange and unfamiliar to them as the pressure of buttons, etc. The result with an intelligent monkey would probably have been different.

Gradually he improves; increased power of independent production gives step by step increased power of imitation, until he approaches too closely the limits of his capacity in this direction to make any further progress of an appreciable kind.

But this is an incomplete account of the matter. The power of learning by imitation is part of the general power of learning by experience; it involves mental plasticity. An animal which starts life with congenital tendencies and aptitudes of a fixed and stereotyped kind, so that they admit of but little modification in the course of individual development, has correspondingly little power of learning by imitation. Among animals, monkeys have the greatest plasticity and the greatest aptitude for imitation. They are incessantly active in all kinds of ways, and they are in a very high degree capable of learning by experience. Thus, when admitted to the company of human beings, they will sometimes spontaneously learn to imitate the use of knives, forks, cups, plates, etc. In general, the more intelligent monkeys have a wider and more varied sphere of activity than other animals. They are incessantly trying to do things, experimenting in all sorts of ways, and learning rapidly by the success or failure of their attempts. The wide range of their activity involves a wide range of interest. They attend to all kinds of things without any directly practical aim; and the imitative impulse is, as we have seen, a special development of this form of attention. The readiest way of bringing before their consciousness vividly and distinctly an action which interests them is to re-enact it themselves.

Of course at higher levels of mental development the imitative impulse is far less conspicuous because *impulsive* activity in general is checked and overruled by

activity organised in a unified system.[1] Civilised men imitate not so much because of immediate interest in the action imitated as with a view to the attainment of desirable results. As experience widens, the pure imitative impulse becomes combined with other motives to imitation and is to a large extent supplanted by them. To begin with, the young child imitates the sounds uttered by those around it merely for the sake of the imitative activity itself. But as it becomes acquainted with the value of words as means of social intercourse a new motive is added. Every new word now means for it a possible acquisition of new knowledge and power. When the adult learns to speak a foreign language it is this kind of ulterior motive which is usually predominant. The mere process of imitating the sounds he hears may be a dull and disagreeable task. It should also be noted that the general habit of imitating, which leads us to follow suit, when there is no reason to the contrary, is only in part an outcome of the imitative impulse. It is mainly due to ulterior motives which we have already mentioned.

[1] See last chapter, § 6.

CHAPTER IV.

PLEASURE-PAIN.

§ 1. **Introductory.**—The hedonic tone of perception is determined by varying conditions. We may distinguish broadly the pleasure or displeasure which is directly due in the first instance to the perceptual process at the time of its occurrence, and that which arises from preformed associations.

Whatever obstructs or disables perceptual process at the time of its occurrence is disagreeable; whatever favours or furthers it is agreeable. Here it is important to distinguish two sides of perceptual activity: (1) the apprehension of objects, or mere play of attention detached from practical interest; (2) the performance of actions which are guided by attention, but are mainly prompted by practical motives.

§ 2. **Affective Tone of Attention.**—The conditions of pleasure-pain in the mere process of attending, as such, have been well stated by Dr. Ward: "There is pleasure in proportion as a maximum of attention is effectively exercised, and pain in proportion as such effective attention is frustrated by distractions, shocks, or incomplete and faulty adaptations, or fails of exercise owing to the narrowness of the field of consciousness and the slowness and smallness of its changes."[1]

The monotonous continuance or repetition of the same kind of presentation, after its interest is exhausted, involves a restriction of mental activity which may be highly

[1] Article on "Psychology" in *Encyclopaedia Britannica*, tenth edition, p. 584.

disagreeable, as in travelling along a road where the scenery is uniform in character, and the villages all similar and similarly situated. A certain amount of variety is necessary for the free play of attention. Where this is lacking, the mind will strive to find objects to exercise its activity upon, and fail disagreeably. On the other hand, a too rapid succession of varying external impressions may be equally unpleasing. The mind, while pre-occupied with one object, is interrupted by the obtrusion of another, and yet another, so that attention is being perpetually warped. This gives rise to the pain of distraction, which may also occur when disconnected objects simultaneously claim attention, so that it cannot be efficiently exercised by any one of them. In attending to the same complex object, pleasure or displeasure may arise from the relation of its parts, which may or may not be adapted to what Kant calls "our faculty of knowing." Where the apprehension of the whole prepares and facilitates the apprehension of the parts, where the apprehension of one part prepares and facilitates the apprehension of another, and where the apprehension of the parts prepares and facilitates the apprehension of the whole, the total activity is pleasant, if it has a sufficiently varied field for its exercise. On the other hand, where at one stage of the process the mind is prepared for a certain kind of continuation and meets with another for which it is not preadjusted, the activity is unpleasant. As examples we may refer to "the pleasurableness of a rhythmic succession of sounds or movements, of symmetrical forms and curved outlines, of gentle crescendos and diminuendos in sound, and of gradual variations of shade in colour, and the painfulness of flickering lights, false time, false steps, false quantities, and the like. In all these, whenever the result is pleasurable, attention can be readily accommodated—

is, so to say, economically meted out; and whenever the result is painful, attention is surprised, balked, wasted."[1] To understand this, we must remember the essentially *prospective* nature of the attentive process. It is always a pre-adjustment for what is coming, and the pre-adjustment varies in its specific nature according to circumstances. If what actually occurs is that for which a specific pre-adjustment has been made, the mental activity proceeds smoothly and successfully without waste of energy. If on the other hand what actually occurs does not fit in with the pre-adjustment, there is a shock of disappointment and a waste of energy.

The simultaneous and successive coordination of movements directed towards one end involves delicate adjustment of innumerable motor impulses. Each of these must have a certain intensity, duration, and rapidity, and they must accompany and succeed each other in a certain order. In general, failure in adjustment, disturbing the activity as a whole and rendering it inefficient, is unpleasant. The peculiar experience of losing one's balance is a good illustration. Part of the unpleasantness of extreme fatigue lies in the muscular tremblings and convulsive jerks to which it gives rise. On the other hand, ease and certainty of adjustment in performing complex movements is a source of pleasure when the movements have not become so habitual as to lose feeling-tone. A free and easy flow of delicately adjusted movements is pleasurable, as such. The pleasures of play in children and young animals are largely of this kind. Compare the mental state of a dog in its struggle to keep standing on its hind legs with that of the same dog in its natural gambols, its mock-fights with its companions, and the like.

There are certain general conditions which contribute to

[1] Ward, *op. cit.*, p. 583.

easy and effective motor adjustment. Among these perhaps the most important is rhythm. In rhythmic movements the same adjustment is repeated at regular intervals, so that it is possible to prepare for it beforehand. In this way waste of energy is avoided, and the maximum of efficiency is attained. All workmen who have to repeat a movement again and again, as in striking with a hammer, or hauling on a rope, fall into a regular rhythm. Concurrence in rhythm between two distinct and simultaneous processes greatly facilitates both. Each process is not only facilitated by its own rhythm, but also by that of the other, and the result is often intensely agreeable. The best instances are dancing and marching to music.[1]

The pleasure or displeasure experienced in observing movement on the part of other persons or things partly depends on the same conditions as those which determine the feeling-tone of our own motor activities. In discussing imitation, we saw that actions which by their intrinsic interest attract attention produce in the observer a nascent tendency to repeat them himself. This tendency is present, even when it does not issue in overt imitation. The sight of external movement occasions an incipient stirring of corresponding activity in the subject who is attending to it. This motor revival forms an integral part of the perceptual complex, not of course a distinct idea. The conditions of pleasure and displeasure which apply to motor process in general, apply also to the reproduced motor process involved in attending to a moving object. When it takes place with special ease and facility and fineness of adjustment, we call the external movement that excites it

[1] Rhythmic activity also produces a diffused excitement of an agreeable kind which intensifies the effect of other pleasure-giving conditions. Thus the rhythm of verse intensifies the effect of poetic ideas and sentiments.

"graceful." But it is not merely the perception of movement that involves the revival of motor activity on the part of the subject. A slender column supporting an apparently disproportionate weight has a disagreeable effect on the spectator. It is as if he himself were supporting a burden to which he is not equal. The mere thought of Atlas bearing up the heavens on his shoulders makes one uncomfortable. The pleasing or unpleasing effect of geometrical forms is also to a large extent due to the motor activity involved in perceiving them. In part, this motor activity consists in actual movements, such as those of the eye following an outline; but in a great measure it arises from our mode of apprehending lines and surfaces as if they were in themselves active. We speak of a column "raising itself" into the air; of a path "winding"; and so on. Language of this kind marks a fundamental feature of perceptual process. The direction of lines and surfaces is apprehended as if it were a direction which the lines and surfaces themselves actively take and maintain. Hence, in apprehending them there is a sympathetic revival of motor activity in us, which may be pleasing or unpleasing.[1] When the geometrical outline is so irregular in its course as to defeat pre-adjustments on our part, and to demand abrupt changes for which we are unprepared, it is disagreeable. On the other hand, a gently flowing curve is agreeable. Of course, if the figure is too simple, it will be almost neutral in feeling-tone, but when it is at once complex and graceful, it may give rise to considerable pleasure. Marked displeasure occurs when sufficient regularity is present to create a pre-adjustment which other conditions disappoint. The experience is also

[1] This view is developed in full detail in Dr. Lipps' work *Raumästhetik und geometrisch-optische Täuschungen.*

unpleasant when, owing to the simplicity or monotonous repetition of the object, attention is not sufficiently occupied. In this case an active tendency is thwarted because it does not find adequate material for its exercise. Of course, what is too simple or too complex for one person may not be too simple or too complex for another.

§ 3. Success and Defeat as Determining Pleasure and Pain.—Under the second head is included a very extensive class of cases so familiar and obvious that it scarcely seems necessary to mention them. Everybody knows that it is unpleasant to be defeated in an endeavour by adverse external circumstances, and that circumstances which facilitate the attainment of the end of an activity are for that reason pleasing. The cat is displeased when the mouse escapes it; the golf-player is displeased when he digs up the turf instead of hitting his ball; the sportsman is displeased when he misses his bird. An analysis of such cases is unnecessary. We need only insist on their importance for the general theory of pleasure-pain. The very fact that they are obvious and familiar makes them important. If we can reduce other instances in which the conditions of the feeling-tone are less obvious to the same general principle, we may fairly claim to have given an explanation. It should be noted that the physiological theory which refers all pleasure-pain to relations of wear and repair in nervous tissue can scarcely be made to apply here. We are pleased when we hit a nail on the head and displeased when we miss it; there seems to be no reason whatever for supposing that in the one case surplus-stored energy is being used up, and in the other not. One would suppose that whatever surplus existed would be common to both.

§ 4. Feeling-Tone due to Pre-formed Associations.—Acquirement of meaning, complication, and associative re-

excitement of organic sensation play an extremely important part in determining the feeling-tone of perception. "The cawing of a rook . . . in itself, is certainly not agreeable. This sound, in the case of those who have lived in the country in early life, and enjoyed its scenes and its adventures, is well known to become a particularly agreeable one. . . . The explanation is that this particular sound, having been heard again and again among surroundings . . . which have a marked accompaniment of pleasure, . . . produces a faint re-excitation of the many currents of enjoyment which accompanied these."[1] To take a simpler instance, the sight of a delicious fruit may give pleasure more because of previous experiences of taste than because of its appearance to the eye. It is important to note that in such cases it is not merely the feeling-tone, the abstract pleasantness or painfulness which is revived; the feeling-tone of the present perception is determined by previous experience only because the perception itself in its cognitive and conative aspect has been modified and developed by this experience. The acquired feeling-tone of the cawing of rooks is the feeling-tone of its acquired meaning. It re-excites a total disposition left behind by previous perceptual experience, and this is the source of its pleasantness. Probably the re-excitement of organic sensations also plays an important part in this instance. In other instances it is very prominent. The sight of food disgusting to the taste may produce actual nausea. The sight of a drawn sword produced in James I. a highly unpleasant organic disturbance. The mere sight of another person sucking a lemon makes some people vividly experience the corresponding organic sensations which may be to them highly disagreeable.

[1] Sully, *The Human Mind* vol. ii., p. 78.

CHAPTER V.

EMOTIONS.

§ 1. General Characteristics.—If we ask the question, What is an emotion? the first answer that occurs to common sense is a list of specific emotions—fear, anger, hope, suspense, jealousy, and the like. When we push the inquiry further, and ask what character these states have in common which leads us to apply the same name, *Emotion*, to all of them, we find psychologists giving various and inconsistent answers. According to some, emotion is essentially a kind of sensation, due to general organic disturbance. According to others, it is the massive revival by association of past pleasures and pains. According to others, it is a tendency to behave in a particular way, and must be regarded as a mode of conative consciousness. The best course for us to pursue in view of this disagreement, is to take certain typical emotions, and to attempt to fix characteristics distinctive of them and common to them in all their manifestations.

(1) There is one prominent fact about emotion which confronts us at the outset :—its wide range. From the lower forms of perceptual consciousness up to the higher forms of ideational and conceptual activity, the same typical kinds of emotion are everywhere present. Anger may arise in connexion with the pain of a wound or the smart of a blow. The wounded lion bites at sticks and stones and at its own wounds. The cat will become angry if you interfere with its kittens. A child will become

angry if you take away its toy. A man will become angry if you fail to understand his argument, or if you unfavourably criticise his book. A saint may also be angry *qua* saint, as St. Paul was angry with the foolish Galatians. It follows from this wide distribution of emotion over different stages of mental development that we must be very careful to avoid giving too limited a definition of its specific forms. Bain, for instance, seems to err in this direction when he says that anger "contains an impulse knowingly to inflict suffering upon another sentient being, and a positive gratification in the fact of suffering inflicted."[1] This would only apply to a somewhat developed stage of free ideal activity; and even then it would not cover such cases as St. Paul's righteous anger with the foolish Galatians.

(2) Closely connected with the wide distribution of emotion is the varied nature of the conditions that arouse it. Any kind of thwarting or opposition may excite anger. Any kind of danger may excite fear. You may produce anger in a dog by disturbing it while eating, or by interfering with its young, or by pulling its tail. It is a certain general kind of situation, not a specific class of objects, which excites a certain kind of emotion.

The behaviour in which emotion finds expression is correspondingly general in its character. It is not an adaptation to the specific nature of this or that specific object, but a general mode of action adapted to a certain kind of situation. The behaviour of the angry dog is generically the same, however the anger is excited. It adopts the same bodily attitude, shows its teeth, growls, attempts to bite, and the like.

(3) There are two sources of emotional states which it

[1] *Mental and Moral Science*, p. 261.

is important to distinguish. Emotions may arise in connexion with definite perceptions or ideas, as when good news excites joy; on the other hand, they may be primarily conditioned by organic changes, such as those which follow the use of alcohol or other drugs. A man's temper varies with the state of his health. The organic changes may operate in one or both of two ways. They may directly change the condition of the nervous system by altering the nature or amount of nutrition with which it is supplied, or in other ways. They may also, by altering the general state of the body, alter the nature of the impulses received by the central nervous system from the internal organs. Owing to the diffusive nature of organic sensations, this occasions a general change in the state of the nervous system, which on the psychological side is experienced as an *emotional mood.* An emotional mood is not quite the same thing as an emotion properly so called. An emotion properly so called must be felt in relation to some definite object; to be angry we must be angry about something. But the general state of irritation due, let us say, to a sleepless night, has not, as such, any definite object. As we shall see under (4), it tends to find objects for itself, and it may pass from one object to another, giving rise to a series of emotions of a similar nature. In general, the occurrence of a definite emotion tends to leave behind it an emotional mood akin to it.

(4) An emotional mood, whatever may be its primary origin, tends to persist when once it is aroused, and to fasten upon any object which presents itself. Ill-temper or gloomy depression or hilarity may originate in the first instance in the use of drugs; but when these moods are once in existence they create objects for themselves. A man who gets up in the morning in a bad temper, due to want of sleep or similar causes, is apt to be irritated by almost

everything that occurs; though in another mood the same incidents would be received with complacency. The cook angered by her mistress will box the ears of the scullion; a herd of cattle, enraged by the sight of a comrade in distress, will vent their fury on their unfortunate companion; the reason being simply that he is the only object on which their attention is fixed. Their excitement must find an outlet; and in the absence of any other definite channel for it, it discharges itself on the injured animal. "It is sometimes seen in dogs, when three or four or five are met together, that if one suddenly utters a howl or cry of pain, when no man is near it and no cause apparent, the others run to it, and seeing nothing turn round and attack each other."[1] So it is dangerous to approach the males of many species of animals in breeding time, when their angry passions are aroused by sexual rivalry. An emotion or emotional mood involves a certain general trend or direction of activity, which particularises itself in whatever way it can, according to circumstances.

(5) The fifth feature of emotion is what we may call its parasitical character. So far as emotions are excited by general situations, and not merely by general organic changes, they are usually secondary phenomena, and pre-suppose the existence of more specific tendencies. This is true of all but the simplest and most primitive emotional states. The anger produced in a dog by taking away its bone pre-supposes the specific appetite for food. The anger produced in it by interfering with its young pre-supposes the specific tendency to guard and tend its offspring. So the presence of a rival who interferes with its wooing causes anger because of the pre-existence of the sexual impulse.

[1] Hudson, *The Naturalist in La Plata*, ch. xxii. (towards end).

(6) In all the more intense phases of emotion, organic sensations form an important constituent of the total state of consciousness. This is true whether the emotion has been primarily introduced by organic changes, or whether it has in the first instance arisen in connexion with definite perceptions or ideas. This fact has been made the basis of a general theory, according to which the essential nature of the emotional consciousness consists in sensations arising from change in the internal organs of the body, including both viscera and muscles.

§ 2. **General Theory.**—The general theory of emotion to which we have just referred has met with much favour and has been much discussed. It is at least as old as Descartes, but is now specially connected with the name of Professor James, who has advocated its claims with great force and eloquence. We cannot do better than quote his statement of the main argument in favour of the view that emotion is simply organic sensation and nothing else. "I now proceed to urge the vital point of my whole theory, which is this: *If we fancy some strong emotion, and then try to abstract from our consciousness of it all the feelings of its bodily symptoms, we find we have nothing left behind,* no 'mind-stuff' out of which the emotion can be constituted, and that a cold and neutral state of intellectual perception is all that remains. . . . What kind of an emotion of fear would be left if the feeling neither of quickened heart-beats nor of shallow breathing, neither of trembling lips nor of weakened limbs, neither of goose-flesh nor of visceral stirrings, were present, it is quite impossible for me to think. Can one fancy the state of rage and picture no ebullition in the chest, no flushing of the face, no dilatation of the nostrils, no clenching of the

teeth, no impulse to vigorous action, but in their stead limp muscles, calm breathing, and a placid face? The present writer, for one, certainly cannot. The rage is as completely evaporated as the sensation of its so-called manifestations, and the only thing that can possibly be supposed to take its place is some cold-blooded and dispassionate judicial sentence, confined entirely to the intellectual realm, to the effect that a certain person or persons merit chastisement for their sins. . . . The more closely I scrutinise my states, the more persuaded I become that whatever moods, affections, and passions I have are in very truth constituted by, and made up of, those bodily changes which we ordinarily call their expression or consequence; and the more it seems to me that if I were to become corporeally anaesthetic, I should be excluded from the life of the affections, harsh and tender alike, and drag out an existence of merely cognitive or intellectual form."[1]

This passage is certainly eloquent, but it lacks logical stringency. It does not follow that because *A* is necessarily and essentially connected with *B*, that *A* and *B* are identical. A stone cannot fall into water without making ripples, but the ripples are not the stone. A line cannot have length without direction, but length and direction are not the same. There is no smoke without fire, but smoke is one thing and fire another. So it may be impossible for emotion to exist without expressing itself; but it does not therefore follow that the sense-experiences due to the expression constitute the whole emotion. Supposing Professor James's thesis to be true, it is evident that we cannot invert it. Certainly not all organic sensation is emotion; hunger and stomach-

[1] *Principles of Psychology*, vol. ii., pp. 451-453.

ache are not emotional experiences. To complete the theory therefore it is necessary to distinguish the kinds of organic reaction which produce emotion from those which do not. So far as we can gather Professor James's view on this point from his own statement, it would seem that he connects emotion with diffused disturbance affecting many organs. But all organic disturbances are diffused in this way. The experience of a cold douche, or of being shampooed after a Turkish bath, ought on this theory to be emotional.

It is evident that the organic sensations which enter into an emotional state must either occasion, be preceded by, or accompany a special kind of disturbance in the nervous system, which is not present in the case of all organic sensations. Now no doubt to some extent organic sensations can produce such specific nervous excitements. They do so in so far as an emotional mood is traceable to such causes as the state of health or the use of drugs. But here we must allow for the direct effect of organic conditions on the nervous system itself and its nutrition, as well as for the sensory impulses which proceed to it from the internal organs. Further, what thus arises is not primarily an emotion, but only an emotional mood. When we consider the emotions which arise in connexion with definite perceptions and ideas, the inadequacy of the theory becomes still more evident. In such instances the diffused organic disturbance has its primary origin in a disturbance of the nervous system, which is propagated over the body as a whole. It follows that the first stage of the process by which the emotion arises cannot be, as James says it is, a "cold and neutral intellectual perception." I have at this moment a somewhat cold and neutral intellectual perception that I shall some day die: but this awakens in me no perturbation of

visceral or motor consciousness. On the other hand, a madman presents a pistol at me: here too, I have an intellectual perception of the madman as presenting the pistol; but this time it is followed by general organic disturbance. Now what is the difference between the two intellectual perceptions which accounts for the difference in their result in the two cases? On the physiological side, the perception of the presented pistol must correspond to an intense and diffused disturbance of neural equilibrium; for otherwise there is nothing to account for the intense and diffused disturbance of general organic equilibrium. On the other hand, the mere recognition that I shall die some day does not upset my nervous balance so as to cause an organic shock. Now on the psychical side, what corresponds to the original neural disturbance which pre-conditions the organic disturbance? If the correlated psychical state is not of the nature of emotion, what can it be? It is perfectly arbitrary to suppose that organic sensations have a mystic efficacy which can belong to no other sensations. After all, they only occur in the same way as other sensations: they arise like the rest only through stimulation of the brain by impulses passing along afferent nerves. If they contribute to produce or heighten emotion it can only be because they help to excite an intense and widespread nervous disturbance. But there is no reason in the world why perceptions or ideas from external objects should not operate in the same way. In fact they must do so if we are to account for the organic disturbance at all, and this agrees with what we may call the normal, unsophisticated view, that emotion essentially precedes and pre-conditions its expression. There is nothing in the perception of a bear, as such, to produce the organic

sensations and movements characteristic of fear. The symptoms of fear arise only when the sight of a bear startles a man, either because it is a strange and big animal approaching, or because previous experience has taught him to apprehend it as dangerous. "Let Professor James be confronted first by a chained bear and then by a bear at large; to the one object he presents a bun and to the other a clean pair of heels."[1] In any case, it is not the visual perception, as such, but its startling character which is essential.

The only mode of attempting to escape this confusion is by saying that the organic disturbance arises in the first instance in a mechanical way. On this theory there are certain innate or acquired physiological prearrangements owing to which certain visual or other perceptions set up organic disturbances. Such a view is irreconcilable with the facts. Emotions accompanied by marked organic disturbances are not occasioned merely by the perception of certain objects. They are occasioned only by occurrences which powerfully thwart or further instinctive or acquired conative dispositions. A man does not feel fear merely because he sees a bear, but because his life is threatened, and "all that a man has will he give for his life." The theory of James ignores this essential relation of the circumstances which produce emotion to pre-existing conative tendencies. According to this theory, it is the mere sight of a kitten being removed which excites anger in the mother-cat. Parental affection has nothing to do with it. But obviously the interference with parental instinct is a most essential constituent of the emotional state. It is directly accompanied by a nervous disturbance which precedes and conditions the organic reaction. If the

[1] Ward, *op. cit.*, p. 586.

organic disturbances accompanying emotion were occasioned in the mechanical way assumed in James's theory they would arise from excitement of the lower nervous centres. But the organic shock of emotion arises only from impressions which excite the higher nervous centres in an especially intense way. The lower nervous centres are just those which are most stable, and which behave in a calm and equable manner. They discharge automatic functions which are matters of routine. We cannot ascribe to them widespread and irregular perturbations of the whole system.

This criticism leaves untouched the fact with which Professor James starts. We cannot imagine what an emotion would be like apart from the organic sensations which it includes. Even in faint and transient emotional experiences the organic element appears normally to be present. It accompanies a slight touch of irritation or a slight tinge of contempt, as it accompanies intense disdain or wild fury.[1] The difference seems to be only one of degree. But in admitting that organic sensation is a factor normally present in the constitution of those states which we call emotional, we do not admit that it is the sole factor. Where the emotion arises primarily in connexion with perceptions and ideas, it involves a primary disturbance of mental equilibrium, connected with the furtherance or hindrance in special ways of conative tendencies. This primary disturbance, being the precondition of the organic reaction, cannot be regarded as its effect. It is therefore an independent factor in the constitution of the emotion. In so far as an emotion

[1] Of course overt expressional movements, or other bodily changes visible to the external observer, may be absent in slight, and sometimes even in intense emotions. But what is important is not this overt expression, but internal organic changes, affecting for example the circulation and respiration.

has its first source in organic conditions, the case for Professor James seems stronger. But there are two points to be considered. (1) The organic changes may directly involve the brain itself and its nutrition, so that the whole effect cannot be referred to sensory impulses coming from the internal organs. (2) We must allow for what Professor Ladd calls "surplus excitation." The sensory impulses, besides producing the special sensations corresponding to their specific character, also tend to produce a more or less diffused excitement of a vague kind, which may be similar for sensations differing in their special qualities. This surplus excitation may be analogous in its character to that which arises in connexion with perceptions or ideas, so that the emotional mood of irritation may have its primary source either in the annoying behaviour of a companion, or in a bad state of health.[1]

[1] James's theory of emotion has, since its first publication, been more or less modified both by himself and others. In the text, I deal with it in its most original and distinctive form. Some would correct James's statement by saying that the expression is not a pre-condition of the emotion, but one aspect of the occurrence of which the emotion is another. I do not dispute this, but I should like to know definitely what it means. Velocity and direction may be said to be two aspects of motion, but emotion and expression are not connected in this way. The brain is a locally separate part of the organism; and organic changes occasioned by brain excitement follow the neural process as its consequences. It may be admitted that the neural process could not exist if it could not discharge itself; and in this sense expression and primary neural disturbances may be regarded as different aspects of the same occurrence. The real question is, whether the primary neural disturbance is itself correlated with consciousness of an emotional kind, or at any rate with consciousness which forms an essential constituent of the complete emotion. According to James, as I understand him, this is not so: according to him, the primary nervous disturbances must first produce changes in the other organs of the body; and these changes must by a back-

What we have conceded to James is that *normally* organic sensations enter as contributory factors, though in very varying degrees, into all emotional states. But it does not follow that this is an absolutely indispensable condition. The only way of deciding this question is by considering pathological and other cases in which the required bodily sensibility has been absent. Evidence of this nature seems to be decidedly unfavourable to the view that where such anaesthesia exists the capacity for emotion ceases. In particular, Professor Sherrington "found that it was possible to operate on a dog in such a way as to render it impossible for visceral changes to send impulses to the brain, and yet to maintain the animal in a fair state of health, and he observed that a dog in this condition exhibited most of the symptoms of emotion when appropriate means were taken to excite its instincts."[1]

stroke react on the nervous system before the emotion can begin. Emotion is in his view the consciousness connected with the re-impression following expression. The initial nervous excitement is on this view excitement of the lower centres and has no appreciable concomitant in consciousness. James does indeed speak of the initial perception which gives rise to an emotion as being the perception of an *exciting* fact. But he does not refer to mental excitement. The fact is exciting because the perception of it sets up organic changes which in their turn by way of backstroke give rise to mental excitement. As he says, the feeling of these changes as they occur is the emotion. Thus his phrase, "the bodily changes follow directly the perception of the exciting fact," means that they follow the fact that excites *them*, not the fact that excites *us*. If he does not mean this there is nothing distinctive in his theory at all. Very few would dispute that organic resonance is normally a factor in fully formed emotion. Bain has said this as clearly as James; and the present writer would be the last to deny it. But if there is a mental excitement preceding the organic resonance, this also must be counted as belonging to the emotion.

[1] MacDougall, *Physiological Psychology*, p. 113.

It is, of course, possible that the dog might exhibit such symptoms without feeling the emotional excitement. But in the absence of strong positive reasons for holding this view, the presumption is the other way, and the facts constitute a serious objection to James's theory as a whole. It should also be mentioned that minute experimental research into the nature of the organic changes connected with emotion shows that these changes may be similar for different emotions and dissimilar for the same emotion. This also is very difficult to reconcile with the theory.

§ 3. **Relation to Pleasure-Pain and Conation.**—Every special kind of emotion essentially involves a characteristic end or direction of activity, mental or bodily. Anger tends to destroy or disable its object; fear, to avoid or evade it. The relation of special emotions to pleasure-pain is not so definite as their conative aspect. Some emotions are invariably pleasant and others unpleasant; grief for instance is always disagreeable,[1] and joy agreeable. So fear is constantly disagreeable. But other emotions may be either pleasant or unpleasant, according to circumstances. A surprise may be either welcome or unwelcome. Anger is highly disagreeable when it is impotent; but when it can wreak itself on the enemy, it may be intensely agreeable. In general we may say that an emotion is agreeable or disagreeable according as the conative tendencies involved in it are thwarted or gratified. In fear and grief, they are from the nature of the case obstructed; when the

[1] There is such a thing as the "luxury of grief," but the mere existence of the grief does not constitute the luxury. A person may be grieved and at the same time he may be pleased to know that he is grieved. Sorrow over the loss of a beloved object may be accompanied by the pleasure due to tender reminiscences, and this pleasure may overbalance the pain of grief. But grief in and for itself is never pleasant.

obstruction ceases, the emotion ceases also. In joy, on the other hand, they are gratified by the very nature of the conditions which occasion it.

§ 4. **Ultimate Qualitative Differences.**—Emotion in its various specific forms involves correspondingly specific kinds of feeling which cannot be explained away as resultants or complications of more simple elements. When we have said that a specific emotion is characterised by a certain trend or direction of activity, that it is accompanied by certain kinds of organic sensation, that it is pleasant or painful, and the like, though all this may be true, it is not exhaustive. Each specific kind of emotion has also something in it peculiar and undefinable. It is a unique kind of feeling-attitude towards an object. As Professor James observes: "There are infinite shades and tones in the various emotional excitements which are as distinct as sensations of colour are." Besides its own specific quality of feeling, an emotion has no doubt also a feeling-tone of pleasure or pain. But its peculiar colouring cannot be resolved into mere pleasantness or unpleasantness. It stands out as a fact unique and irreducible.

§ 5. **Emotional Dispositions.**—An emotion is always an actual state of consciousness; an emotional disposition is a persistent tendency to feel a certain kind of emotion in the presence of a certain object. Thus the cat, after having its tail pulled frequently by a child, has a permanent tendency to feel angry whenever the child approaches it. We have pointed out that the original conditions of emotion are rather certain general kinds of situation than specific persons or things. But in the course of experience they come to be connected with specific persons or things, as the anger of the cat comes to be connected with the approach of the child who pulls its tail. In this way emotional dispositions are formed which manifest them-

selves in the form of actual emotion on appropriate occasions. An emotional disposition is not the same thing as an emotional mood. The mood is an actual affection of consciousness; but the disposition persists when neither the mood nor the emotion itself is being felt. Such words as liking and disliking, hate and love, indicate emotional dispositions rather than actual emotions. We say that the cat dislikes the child, meaning, not that it is actually feeling angry with the child at the moment, but that it has a permanent tendency to feel the emotion of anger whenever it sees the child in its neighbourhood. On the higher levels of mental life, where ideas and concepts play a prominent part, emotional dispositions are very complex, and are called *Sentiments* or *Interests*.

§ 6. **Analysis of Fear.**—To describe and analyse all the various kinds of emotion would be an endless task. We therefore select for special treatment two typical forms—fear and anger. We shall have occasion to deal with some other modes of emotional experience at a later stage, when we come to treat of ideational as distinguished from perceptual activity.

In fear, as in all painful feeling, conative tendency is at once excited and obstructed. But the conation must be of a special kind. It must be a tendency to practical adjustment more or less imperatively demanded by a practical emergency of a serious nature. Thus the conditions which cause fear must be aggressive or otherwise obtrusive in their character. The occasion of fear must not come before consciousness as something that can be avoided or evaded with ease and certainty.

The experience must invade consciousness in a more or less violent and persistent way so as to call imperatively for a practical adjustment to the situation. At the same time it must be of a nature to destroy efficiency—to dis-

organise and disable the activity which it excites. It may seem from this account of the matter that fear is always disadvantageous, and that it can be nothing but a drawback in the struggle for existence. This inference is partially true. Fright often serves the predatory animal rather than the frightened prey. "Many birds, though scarcely wounded by small shot, fall to the ground as though struck by lightning, panting with wide open mouth."[1] Seal-hunters often make use of the paralysing effect of fright in order to secure their prey. But even when terror strikes an animal motionless the result is not always disadvantageous. By becoming quiescent it is more likely to escape notice. Where mental and bodily perturbation are not violent enough to deprive the animal of all power of effective action, it takes to flight or hides itself. So far as these movements of escape or evasion are the direct expression of fear, they are to be explained on the general principle that psychical activity, when its way is barred in certain directions, diverts itself into whatever channel it can find. Thus an animal disabled by fear from more positive and complex modes of adjustment, will have recourse to flight. Now the circumstances may be actually such that flight is the best course or the only course that can be of use. When this is so, the fear that expresses itself in flight is an advantage. In point of fact, when animals run away or hide, it is generally the best thing they can do. But this is not always so. A dog that runs away scared at the noise of a cracker, derives no benefit from so doing. Further, fright is to some extent a disadvantage to an animal even in escaping from an enemy. The excitement of the emotion may indeed accelerate its movements. But at the same time presence of mind is

[1] Hudson, *Naturalist in La Plata*, ch. xv

more or less lost. Watchfulness and readiness of resource are diminished. Thus the animal rushes wildly into the danger which it is striving to avoid, or into some other danger of a yet more deadly nature. The game old fox may be but little influenced by fear when, in escaping from the hunters, it displays its wonderful command of all kinds of cunning resources, its wariness and keenness of perception. Whyte-Melville says of such a fox: "His heart like his little body was *multum in parvo*, tough, tameless, and as strong as brandy." As regards the general question of the utility of fear, we may say that on the whole it is a means of preservation from injury and death. But it is rather a clumsy means, and in part defeats itself, especially when the emotion is very violent. As Mosso remarks: "The graver the peril becomes, the more do the reactions which are positively harmful to the animal prevail in number and in efficacy. . . . We might almost say that nature had not been able to frame a substance which should be excitable enough to compose the brain and spinal marrow, and yet which should not be so excited by exceptional stimulation as to overstep in its reactions those physiological bounds which are useful to the conservation of the creature." [1]

We may now enumerate the conditions which generate fear.

(*a*) Actual bodily pain produced by wounds is, when sufficiently intense, accompanied by the same kind of impotent excitement, the same kind of disablement of bodily and mental activity which is characteristic of fright. Wild efforts to escape, laboured breathing, palpitation, trembling, etc., are expressions of actual bodily pain as well as

[1] *La Paura*, Appendice, p. 295; quoted and translated by James, *Principles of Psychology*, vol. vii., pp. 483-484.

of strong fear. Now we find not only analogy but genetic relation between the two states. When an object which has previously caused pain is again perceived, the emotional tone is one of fear, unless fear is displaced or overpowered by anger. This has suggested to Herbert Spencer the theory that the fear consists in the revival of bygone painful sensations produced by the object feared. "Everyone," he says, "can testify that the psychical state called fear consists of mental representations of painful results."[1] Against this view we urge that whereas the painful sensations vary greatly in specific quality, the emotion of fear which they generate is substantially identical, and differs more in its character from them than they do from each other; we urge also that the emotion of fear is sometimes more violent and disagreeable than the original experiences of which it is supposed to be a revival, or mental representation.

What appears really to happen when a previous experience of pain gives rise on a subsequent occasion to the emotion of fear, may be illustrated as follows. A child, attracted by the brightness of a flame, grasps it and is badly burnt in consequence. Subsequently, on seeing the flame he feels fear. The emotional tone belongs to the present perception because of the previous painful sensation inflicted by the perceived object. The original painful sensation, when it actually occurred, occurred as part of a perceptual activity which was one and continuous in all its aspects. The painful sensation was not merely superadded to the visual perception of the object as a separate and isolated event, it was an integral phase of the same continuous process. The visual perception and the sensation of burning form part of the perception of one and the

[1] *Psychology*, § 213.

same object. The advent of the burning pain must therefore make a profound difference in the character of the perceptual process as a whole, and in the total disposition which the experience as a whole leaves behind it. Hence, when the object is again seen, the mere sight of it, even before previous painful experiences recur, will be a profoundly different state of percetpual consciousness from what it would have been if they had never existed. The motor attitude will be essentially modified. There will be a tendency to retreat from or avoid the flame, instead of grasping it. Further, a state of diffused nervous excitement analogous to that which accompanied the actual burning will be re-excited; and this will overflow the organism as a whole, producing constriction of the superficial blood-vessels, palpitation, trembling, and the like, with the corresponding organic sensations.

(*b*) That this account of the matter is correct becomes clearer when we consider that fear arises in other ways than through experience of previous pain or injury. The mere suddenness or intensity, or the combined suddenness and intensity, of an impression are sufficient to cause fear. A loud noise for which we are unprepared startles us with momentary alarm. Many people cannot help being scared by a reverberating peal of thunder, though they know that it is harmless Of course much depends on the nervous organisation or on its state at a given time. It is extremely easy to startle a hare or a rabbit. Even a slight noise will give us a disagreeable shock of alarm if we are half-asleep. In some pathological states the patient is liable to be frightened by almost anything. Fledgelings shrink down in the nest when a strange animal or object suddenly approaches, though they may show no uneasiness when their deadliest enemy approaches them unobtrusively as snakes do. "A piece of paper blown suddenly by the

wind is as great an object of terror to a young bird as a buzzard sweeping down with death in its talons."[1] The sudden approach of an object, the abrupt occurrence of an intense sensation, stimulate to action: there is a demand for practical adjustment to the obtrusive experience. At the same time its very suddenness or intensity disconcert and startle, so that efficient reaction is impossible. This is the more conspicuously so, where the impression is not only sudden but unfamiliar. Mere unfamiliarity or strangeness, apart from suddenness or exceptional intensity, suffice to cause fear even in a violent form. The young gorilla brought home by the members of the Loango expedition much disliked strange noises. "Thunder, the rain falling on the sky-light, and especially the long-drawn note of a pipe or trumpet threw him into such agitation as to cause a sudden affection of the digestive organs, and it became expedient to keep him at a distance."[2] The kind of unfamiliarity which so disturbed the gorilla consisted apparently in mere novelty.

Unfamiliarity may, as I have said, consist in mere novelty. But there is another kind of unfamiliarity which involves not only novelty but direct conflict with ordinary experience. Strangeness of this sort may cause profound alarm. An experience may be so discordant with the normal course of events as utterly to check and disorder the process of conscious life and destroy the possibility of effective adjustment. In the case of human beings the fright caused by a ghostly apparition is a good illustration. This is not so much due to any definite or indefinite anticipation of positive evil as to the utterly abnormal character of the experience. It lies so wholly outside the circle of ordinary

[1] Hudson, *Naturalist in La Plata*, ch. v.

[2] R. Hartmann, *Anthropoid Apes*, p. 265; quoted by James, *Principles of Psychology*, vol. ii., p. 417 (note).

events, and is so completely opposed to the conditions of ordinary experience, that it destroys all presence of mind. It stimulates intensely by its strangeness, and at the same time, owing to this very strangeness, all lines of activity, theoretical and practical, are obstructed. It is instructive to contrast this overwhelming terror in the supposed presence of a ghostly apparition with the predominantly agreeable experience of reading or listening to a tale of marvel. The actual fact obtrudes itself as actual, and demands immediate practical adjustment to it, and yet by its very nature makes such adjustment impossible. Where this practical need is not felt, the free play of imagination liberated from the trammels of ordinary experience may be a source of delight.

Animals are capable of analogous experiences. James gives a good example.[1] A dog belonging to Professor Brooks, the well-known biologist, was frightened into a sort of epileptic fit by a bone being drawn across the floor by a thread which he did not see. As James remarks, any man's heart would stop beating, if he perceived his chair sliding unassisted across the floor.

§ 7. **Analysis of Anger.**—The child manifests this emotion at an early stage. "Anger initially expresses and satisfies itself by a peculiar form of violent motor discharge. Even at the outset it takes the form of an effort to overcome resistance by main force. The young child who has acquired no definite mode of wreaking its passion, shows it by vague kicking and struggling, by movements which antagonise each other, and which encounter resistance in external objects. The development of cognitive consciousness simply serves to restrict this diffused mobility within more definite channels. The child in a later stage throws

[1] *Principles of Psychology*, vol. ii., p. 420.

his plaything violently to the ground, or pushes it away, or breaks it, or, in the case of a person who thwarts his will, he kicks, pushes, or strikes. Even the adult may find some satisfaction for his irritation in destroying furniture, and he nearly always has a strong disposition to break, crush, tear, or rend something. Inasmuch as his anger has become enlightened and defined, his destructive impulse will become more specially directed against the object by which his desires are crossed or thwarted. But when the conditions deny him this satisfaction, it is well known that the angry man is very apt to wreak his anger on inoffensive things or persons, thus approximating to the condition of the child. Though the tendency to overcome resistance by violent exertion of bodily force seems always to play some part in anger, yet with the advance of intellectual development it gives place more and more to an ideal satisfaction; it becomes enough to know, or sometimes even to imagine, that the opposing forces have been crushed by our agency. This is of course a direct consequence of the growing importance of the life of ideas as compared with that of perception. But even in the ideal satisfaction of anger the impulse to destroy or break down opposition may be satisfied to some extent by wreaking it on other objects than those which immediately awaken resentment. The relief afforded by swearing comes under this head. It is a breaking down of the ideal barriers which social convention or religious sentiment sets up." [1]

Turning now to animals, we find that their proneness to anger depends to a great degree on inherited organisation and general habits of life. Spencer observes: "The destructive passion is shown in a general tension of the muscular system, in gnashing of teeth and protrusion of

[1] *Analytic Psychology*, vol. ii., pp. 96-97.

claws, in dilated eyes and nostrils, in growls: and these are weaker forms of the actions that accompany the killing of prey."[1] Here there are two implications that deserve notice. It is implied that the expression of emotion consists in actions which are only rudiments of more developed activities. This is of course untrue. Actual tearing and rending may be as much an expression of the destructive passion as the gnashing of teeth and protrusion of claws. In the second place it is implied that anger is distinctive of predatory animals. But this is not the case. The elephant is not a beast of prey, but can be easily roused to fury. It is the combative rather than the hunting instinct which is essential. Many graminivorous animals which are usually peaceful are highly dangerous in the breeding season, when the combative impulse is excited in connexion with the sexual, and finds its proper field in sexual rivalry. In general we may say that some animals, such as the elephant, meet danger and opposition by main force; others, such as the rabbit and hare, by flight and concealment. Yet others mostly resort to evasion and escape, but become combative and even aggressive at certain seasons. The combative tendency is the pre-disposing cause of that emotional seizure we call anger. All animals whose play takes the form of mock-fights may be roused to fury. Any kind of opposition, any thwarting or restriction of psychical activity may cause anger. It is the more likely to do so the more distinctly the interference wears the appearance of coming from some positive external agency and especially from some other animal. We may be merely grieved at the loss of a valued object if we accidentally mislay it ourselves; but if somebody or something breaks it before our eyes we are more apt to be angry. It must not however

[1] *Principles of Psychology*, vol. ii., p. 546.

be supposed that the emotion of anger vents itself exclusively on an offending object. On the contrary, the emotion is essentially a general impulse to crush and destroy. It fastens by preference on the cause of irritation; but failing this it may vent itself impartially on anything which comes in its way. It is only through experience and education that it becomes restricted and defined.

The conditions which occasion fear in one animal may occasion anger in another. Any condition which thwarts conation may give rise to an outburst of destructive violence. But in fear mental and bodily activity is at once stimulated and thwarted. Now the obstruction and oppression which in a timid creature paralyses or disorganises all activities, save those of flight and concealment, may in a combative animal rouse to active resistance and counter-aggression. This holds good of actual bodily pain. The attitude of a man in bearing bodily pain is different according as he gives way to it or fights against it. The smart of a wound received in the heat of combat usually infuriates the combatant. All fierce animals, such as the lion or tiger, become fiercely aggressive when they are hurt. Belt supplies an interesting illustration from insect life. Speaking of leaf-cutting ants he says: "The effect of a little corrosive sublimate sprinkled on one of their paths in dry weather is to make them mad and exterminate one another. . . . . In a couple of hours, round balls of the ants will be found all biting each other; and numerous individuals will be seen bitten in two, while others have lost their legs or antennæ."[1]

[1] *Naturalist in Nicaragua*, p. 79.

BOOK III.

PART II.—Growth of the Perception of the External World.

CHAPTER I.

Nature of the Problem and its Presuppositions.

§ 1. **What is meant by the External World.**—By the External World we ordinarily mean the system of things extended in space and apprehended as existing, persisting, coexisting, changing and interacting independently of the processes occurring in the life-history of the individual minds which have cognisance of it. It has accordingly three characteristics which we must constantly keep in view: (1) Extension in space; (2) independence of the process by which individuals apprehend it; (3) unity, in virtue of which its parts are members of a whole, *i.e.* are all parts of one external *world*.

§ 2. **The Psychological Problem.**—There are two questions which we must carefully distinguish. We may inquire how the external world is really constituted. If this is the question which we set before ourselves, we are not obliged to accept as final the view of the nature of external objects which is presupposed in ordinary thought and

conduct. For it may be that this view, though it works well enough for ordinary purposes, will not stand the test of philosophical criticism, but requires to be corrected and reconstructed. Thus, it has been maintained by Berkeley and John Stuart Mill that the external world does not really consist in a system of distinct things actually existing, enduring, changing and interacting independently of the coming and going of sense-experiences in the minds which perceive it. They substitute for this the view that it really consists only in a fixed order of sensations actual and possible. Now whether this is true or not, it clearly does not coincide with the view which pervades our daily life or the procedure of physical science. It can only be maintained in opposition to common sense.

The other question which we may raise is the one with which alone we are here concerned. It is distinctly psychological rather than metaphysical. From the psychological point of view the belief in external objects, presupposed in ordinary thought and conduct, is taken as a datum without any attempt to criticise or correct it. The problem is merely to trace the process of its development from rudimentary stages until it assumes the highly complex form which it has for the normal consciousness of adult human beings. In general, this process consists in the progressive work of attention as conditioned by retentiveness and association preserving results previously attained as the basis of new achievements. The knowledge of external objects is from beginning to end dependent on sense-experience. But as mental development advances the value of a given sense-experience comes more and more to depend on its acquired meaning; and it is the distinctive function of the psychologist to trace the steps and stages through which meaning is acquired by attention, retention, association, and reproduction.

But before entering on this task, he has first to face an initial problem. He has first to determine clearly what he is going to presuppose as belonging to the *original* in distinction from the *acquired* meaning of sense-experience. In dealing with this question, he is not bound to maintain absolutely that all the factors which he presupposes are really by their nature incapable of being acquired from more primitive beginnings, so that it would be a hopeless undertaking for any psychologist to attempt to account for them in this manner. Decision on such points, so far as it is attainable, may be left to what is known as "Theory of Knowledge." The main concernment of the psychologist is to guard himself against the danger of explaining in a circle by unconsciously introducing among the essential conditions of mental development what he pretends to account for as its result. To avoid fallacies of this sort it is best to err on the safe side, if at all, and to rank as original whatever he cannot clearly account for as derivative.

§ 3. **What have we to Presuppose as Primary? (1) Particular Data.**—The external world as we now apprehend it consists (1) in a multiplicity of distinct items connected, (2) in the unity of a single system. Our problem therefore has two sides, the original apprehension of the particular data of sense-perception, and the original apprehension of their unity as parts of a whole—of what we now call a single world.

As regards the nature of the primary datum of sense, as we may call it, it would seem that it must include from the outset more than mere sensuous presentations, considered in severance from any mental reference to existence beyond them. If there is a stage in which the mind is aware only of its own sensations, it does not seem possible to point to any known psychological processes by which

this stage could be transcended so as to yield cognisance of a multiplicity of independently existing things.

The transition could not be effected through retentiveness and association. For, in order to be retained, knowledge must first be gained; hence if we are primarily confined to knowledge of our own sense-experiences, these may indeed come to mean for us other related sense-experiences, past, future, and possible, but not a world of existences persisting and changing independently of the coming and going of our sensuous presentations. We must, therefore, assume that the simplest datum of sense-perception from which the cognition of an external world can develop consists, not merely in a sensuous presentation, but in a sensuous presentation apprehended as conditioned by something other than itself.

Here it is important to define carefully how much and how little this assumption implies, so as to avoid difficulties which may otherwise prove troublesome. What is assumed is that the simplest object of sense-perception is complex, consisting in a sense-experience and a related condition. But it is not implied that primitive consciousness starts with an analysis of this complex object into its constituent factors so as to distinguish explicitly the condition from the conditioned sensation. On the contrary, the distinction is not explicitly drawn even at advanced stages of mental development unless there is special occasion for making it. It arises only on critical reflexion. What is initially apprehended is an unanalysed total object, in which the constituents are undiscriminated, so that the mind is only implicitly aware of them in being aware of the whole to which they belong. Further, the only clue which the mind has to the nature and existence of the condition lies in the nature and existence of the sensation conditioned by it. It has no means of in-

dependently apprehending the condition so far as this is for it merely a material object.[1] This holds generally even for the developed consciousness. It is most clearly seen when we consider how it is possible for us to have before the mind the enduring and changing existence of external objects when they are not actually present to the senses. We can do so only by thinking of our sensuous presentations as continuing and changing. If we drop all reference to sense-experience we altogether lose our hold on the external object.

The most full and definite way of following the continued

[1] "So far as this is for it merely a material object." I insert this reservation because there are two lines of development going on together from the outset and mutually determining each other—that which leads to knowledge of a world of material things, as such, and that which leads to knowledge of other minds. In the process by which a knowledge of other minds develops, the conditions of sensation are apprehended by projection of the self. The essential clue to their nature is supplied by the analogy of the conscious life of the feeling and willing individual. When I see a man lifting a heavy weight, I apprehend him as making an active effort and as having experiences more or less like those which I should have in a similar situation. But, strictly speaking, so far as I thus interpret my sense-experience in seeing the man through my own subjective life as a feeling and willing individual, I am not merely apprehending his body as part of the material world. I am aware not merely of matter, as such, but of mind, as such, other than my own. Now we have good reason to regard such projection of the self as being equally primitive with the apprehension of material things. The knowledge of the world of matter and of the world of mind begin together and to a large extent progress together in mutual interdependence. But the two lines of development, however intimately they may be bound up with each other, are none the less distinguishable and must at this point be sharply distinguished. In apprehending matter as such our sole clue to the nature of the conditions of sensation is found in the nature of the sensations which they condition.

existence of external objects in the intervals of actual perception is by means of definite mental images. For instance, when after looking at something I close my eyes, I may by means of a mental picture think of the continued existence of the visual presentation which I should have experienced if I had kept my eyes open, and in this way follow mentally the continued existence of the thing seen—imagine it as still persisting. This does not imply that I believe my sensations actually to endure when I am not experiencing them. All that it implies is that my sole clue to the conditions of sensation, my sole way of thinking these conditions at all, is by thinking of them in relation to appropriate sensuous presentations. One way of putting this is to say that where actual sensations fail us we are bound to substitute the thought of possible sensations. But even these possible sensations fulfil their function only as determining for our thought the nature of an enduring and changing existence other than themselves. Further, if we are to speak of possible sensations in this connexion, it must be understood that the term *possible* has a very wide application. It must not be taken to mean physical or physiological possibility. It is, no doubt, physically and physiologically impossible to see the luminiferous ether and the processes which take place in it. But this is no reason why we should not think of them by means of visual pictures representing hypothetical sensations. All that is required is that, abstractly considered, apart from physical and physiological conditions, the hypothetical sensations should be in their own nature capable of being experienced by us or by some other mind. The warrant for this is to be found in our having corresponding mental images or in the possibility of our having such images.

In what way precisely do sensuous presentations yield a clue to the nature of their conditions? For psychological

purposes, it seems necessary and also sufficient to answer this question as follows. The conditions are apprehended as related to each other in a way corresponding to the relations given in immediate sense-experience. Thus, every difference in presentation means some corresponding difference in presented conditions; every likeness means some corresponding likeness in these conditions. Similarly, the apprehension of co-existence and succession within sense-experience involves apprehension of co-existence and succession beyond it. Hence the knowledge of relational order in the external world develops *pari passu* with the growing distinctness and fulness of our awareness of the relational order of sensuous presentations. Vague extensity, for example, yields only the apprehension of extension as a continuous whole of co-existent parts. But with the development of the perception of apartness, direction, and position within the sphere of tactual and of visual presentations, there is also a coincident development of the perception of apartness, distance, and direction in the external world.

The exact nature of the assumption we are here making needs to be carefully explained. What we posit is only that for primitive consciousness sense-relations mean corresponding relations somewhere subsisting between conditions of sensation. *Somewhere*; not necessarily in this or that selected portion of matter marked off from others as a separate object of perception. In this wide sense, the original position of primitive consciousness has never been falsified by the subsequent development of knowledge. The visual appearance of a stick becomes bent when the stick is partly immersed in a pool. This difference of sensuous presentation is not, indeed, connected with any change in the shape of the stick. But it does imply a difference in the way the light from it falls on the retina

and in the shape of the resulting retinal impression. When, to use a Kantian example, we look from the top to the bottom of a house, the parts of the house do not succeed each other as our sensations succeed each other. There is no succession in the house itself. But there is successive movement of the eye and head. In general, the attitude which we ascribe to primitive consciousness will be best understood by bearing in mind that it is not falsified, that on the contrary it is confirmed by such cases as these. The primary reference is to the conditions of sensation whatever these may be. The further distinction and analysis of such conditions and the way in which they combine and co-operate is due to an elaborate and complex process. It belongs to the development of the perception of external reality, not to its rudimentary beginnings.

§ 4. **"Categories," or Ultimate Principles of Unity.**—What we have to explain is not merely the apprehension of external objects considered separately as relatively detached items, but also their interconnexion as parts of one world. We have, therefore, to determine whether the unity of the external world can be accounted for merely as due to acquired meaning, or whether, on the contrary, there is some apprehension of it, however rudimentary, from the outset.

Here it is important to remind ourselves that sensations are felt at any moment only as parts of one total sense-experience. As Dr. Ward puts it, "At any given moment we have a certain whole of presentation, a field of consciousness psychologically one and continuous; at the next we have, not an entirely new field, but a partial change within this field." [1] The entire complex of sensations simultaneously experienced contributes to our appre-

[1] Ward, *op. cit.*, p. 536.

hension of the total present situation; and this or that special item within it is singled out only by selective attention under the guidance of special interests. Hence Professor James is probably not far wrong when he speaks of the earliest awareness of the infant as having for its object only "a blooming buzzing confusion."

But this merely sensuous unity is not sufficient for our purpose. It is not sufficient, because the growth of the knowledge of external reality constantly involves the breaking up of this original sense-given unity into a plurality of relatively separate data and the re-combination of these data in new ways. "Out of the variety of impressions simultaneously presented we do not instantly group together all the sounds and all the colours, all the touches and all the smells; but, dividing what is given together, single out a certain sound or smell as belonging together with a certain colour and feel, similarly singled out from the rest, to what we call a single thing. . . . There is nothing in its first experience to tell the infant that the song of the bird does not inhere in the hawthorn whence the notes proceed, but that the fragrance of the May-flower does."[1] There is, we may add, nothing in its first experience to tell the infant that the extension which he sees when he looks at his rattle is identical with the extension which he feels when he touches it.

It is through such separation and re-combination of the original data of sense that the knowledge of an external world gradually develops. Now the question is whether in this process the mind initially apprehends each particular connexion as it comes,—living, so to speak, from hand to mouth; or whether, on the contrary, it starts with some germinal apprehension of the unity of the world,

[1] *Ibid.*, p. 368.

sufficient to enable it, when occasion arises, to expect and seek for connexions not yet disclosed. It would seem that only the second alternative is psychologically tenable. If we are to secure ourselves against the fallacy of explanation in a circle, we must assume from the outset something answering, in however vague a form, to our developed consciousness of the world as a unity—a system within which all parts are in various ways connected with each other.

Further, from the outset this embryo awareness of unity has various aspects answering to the fundamentally diverse kinds of relations given in sense-perception. Among these aspects we may single out for special consideration the rudimentary forms of what the developed consciousness recognises as Spatial Unity, Temporal Unity, Causal Unity, and the Unity of different Attributes as belonging to the same thing. Such forms of unity may be called Categories. Categories are universal principles of relation holding either for all knowable objects or for all of a certain kind. Our position is that such categories belong even to rudimentary perceptual consciousness as a condition of its further development.

§ 5. **Spatial Unity.**—At our present level of mental development, spatial unity means that all extended bodies are extended in one and the same space, which is definitely contrasted as a whole with particular extensions as its parts. When we perceive, imagine, or conceive any particular extension, we think of it as continued beyond itself, so as to be an inseparable portion of the one all-embracing space. Its termination is a boundary in which it meets space beyond it. Further, whenever we think of two extensions which are separate in the sense of not meeting in a common boundary, we think of them as mediately connected by some intervening stretch of space,

and as having some definite position, distance, and direction relatively to each other. Every "here" is connected in this way with every "there."

Now we cannot, of course, attribute to the undeveloped consciousness the full and articulate consciousness of the unity of space which we possess ourselves. None the less if we are to advance securely in our psychological explanations, it would seem that an embryo form of it must be present from the outset as the condition of further growth. We have, at least, to assume that even at the perceptual level, when a thing is apprehended as extended, its extension is not thought as self-complete and self-contained, but as continued beyond itself; also that, when and so far as the mind arrives at a stage in which two separate extended things are thought of together, they will be thought of as connected by intervening space.

The apprehension of space as tri-dimensional is directly bound up with the category of spatial unity. If we consider the extensity of visual or tactual sensations, as such, we find in them only an order of co-existence in two dimensions. They have not any immediately experienced *thickness*. Further, if they had immediately experienced thickness, this would avail us little, because it would stand in no direct relation to the filling of tri-dimensional space by external objects. We only touch the surfaces of things, not what lies beneath the surface. The same is true of sight; inasmuch as we see through anything we do not see the thing itself. Hence, many psychologists have found a difficulty in explaining how it is that we constantly and universally apprehend the external world and every part of it as extended in three dimensions.

The only adequate solution of this problem seems to lie in recognising that from the outset the apprehension of a third dimension is involved in the apprehension of surfaces.

Only superficial extension is directly perceived in such a way that its parts are given together, so that their distinction and relation can be discerned within the whole to which they belong. But any given surface is thought as prolonged beyond itself; and it is not only thought as prolonged into a further surface but also into extension which is not superficial. The further development of the perception of a third dimension will thus depend on the detailed development of our apprehension of the varying shape of surfaces and their varying position, direction and distance relatively to each other. For all such relations will be interpreted as relations of surfaces and parts of surfaces within a third dimension, analogous to the relations of lines within a surface.

§ 6. **Temporal Unity.**—What we assume under this head is that any particular duration or change is, from the outset, apprehended, however vaguely, as having a "before" and "after." In early stages of mental development, owing to the dominance of direct practical interest, the mind is preoccupied with continuation into the future rather than the past. Such reference to the future seems involved even in the most rudimentary forms of the attention process as indicated by the behaviour of animals and children. Even the most primitive attention is essentially prospective; it is a waiting or watching, a being on the alert for what is to come. The given situation has for it a transitional character; it is not something which merely *is* but something which *is to be*. Only on this condition is there a possibility of apprehending it as alterable or wanting it altered in however vague a way. In other words, the reference to the future must be as primitive as conative consciousness.

It would also seem to be a primary condition of the possibility of learning to adjust future behaviour to the

lessons furnished by past experience. Reproduction and association, taken merely by themselves, account for the renewed apprehension of what has been apprehended before; but they do not of themselves explain the emergence of any really new knowledge. Thus, if *B* has once been perceived as succeeding *A*, when on a subsequent occasion *A* is perceived again, then in the absence of any primary reference to the future, the utmost that can result is that *A* will be thought of as having been followed by *B*, not as about to be followed by *B*. *B* never has in any way been thought of as belonging to the future and therefore association cannot recall it as belonging to the future. On the other hand, if in perceiving *A* the mind looked onward to a further development of the present situation, *B* when it came would be identified with this anticipated development. It would initially be apprehended as something future relatively to *A*. Hence the possibility of its being reproduced in this same relation to *A*.

§ 7. **Unity of Attributes in the same Subject.**—Our present thought and perception is always concerned with *propositions* either asserted or merely supposed; and there is no proposition which does not involve directly or indirectly the distinction and relation of attributes and a subject to which attributes belong. We cannot stir a step without such forms as are expressed in language by *S* is *P* or if *S* is *P*, or *S* is *P* or *Q*. Implicitly or explicitly our mental procedure always involves some distinction between things and their nature, between "that" and "what." Is it possible for the psychologist to go back to a primitive stage of conscious life for which there is no rudiment of this category and then proceed to show how it can arise through the extension of experience in accordance with known psychological laws and conditions? It is at least safe to say that no one has yet succeeded in this under-

taking or indeed set about it with any clear and adequate recognition of the nature of the problem.

We may therefore assume that the primary datum of perception is something regarded as qualified by an attribute, the nature of the attribute being initially determined for thought by the nature of the sensation through which it is perceived. Further, this relation of subject and attribute does not merely enter into the constitution of separate particular data. It is rather a fundamental principle of unity preparing the mind to look for attributes which are not yet given. This is plainly so for the developed consciousness. As Hume points out, the idea of substance is essentially the idea of a principle of union. "Thus our idea of gold may at first be a yellow colour, weight, malleableness, fusibility; but upon the discovery of its solubility in *aqua regia* we join that to the other qualities. . . . The principle of union, being regarded as the principal part of the complex idea, gives entrance to whatever quality afterwards occurs, and is equally comprehended by it, as are the others which were first presented."[1]

To show that this principle of union is an original category, we have to lay stress on a point ignored or denied by Hume. We are here dealing with an altogether unique sort of unity. It cannot consist, as Hume supposes, in such relations as those of contiguity and causation. I always find my house in the immediate neighbourhood of another house; but I do not therefore regard the two houses as attributes of the same subject or one of them as an attribute of the other. I may indeed regard them as parts of the same whole. But, to adopt a distinction from Hobbes, the parts of a thing are not therefore parts of

[1] Hume, *Treatise*, pt. i., sect. vi.

the nature of the thing. Head, shoulders, arms, and the like are parts of a man; his figure, motion, weight, size, and the like are parts of his nature. Only the parts of the nature of a thing have that unique form of unity which cannot be otherwise described in ordinary language than by saying that they are attributes of the same thing.

When once it is granted that this form of unity is original and not derivative and also that it works as a principle of union determining the progressive combination of new attributes with those previously given, it becomes clear that its function as principle of union must also be original and not derivative. From the outset a given attribute or given attributes are implicitly apprehended as parts of the nature of a thing and not as its whole nature, so that the mind is prepared to look for further attributes whenever occasion arises and interest prompts it to do so.

The only alternative is to suppose that the new attributes are merely found to be combined with the old, without any principle of anticipation. But if we inquire how this mere finding, this blind stumbling on new combinations, takes place, it seems very difficult to supply any intelligible account of it. For, strictly speaking, the union of distinct attributes in the same material thing is never given as a mere datum of particular experience, except in cases where the relevant sense-experiences are inseparably blended, as colour-quality and extensity are blended in visual sensation. Apart from such cases, all that is given in the way of particular data consists in relations of co-existence and sequence and concomitant variation. Thus, I may perceive something as white and also at the same time something as sweet-scented. But this is quite different from apprehending what is white as identical with what is sweet-scented. A baby, when it looks at its rattle, is aware of something having extended colour; when it

feels its rattle it is aware of something having extended hardness and roughness. But it is a further step to group the colour and the hardness together as qualities of the same thing and to come to regard the extension of the colour as identical with the extension of the hardness. What particular experiences supply consists in guiding clues which require to be interpreted as meaning the union of different attributes in the same thing: and for this there must be some principle working implicitly and, so to speak, underground, which leads the mind to construe them in the way required.

The full strength of this position from the psychological point of view becomes evident when we take account of a fact which ought never for a moment to be lost sight of in discussing questions of this sort. I mean the fact that even in its most primitive stages, whether in animal or human life, learning by experience is really learning by experiment. It involves throughout subjective initiative, trial and failure, and persistency with varied effort. The condition of finding is seeking. Now seeking always presupposes some pre-notion of what is sought. As mental development advances such anticipation becomes progressively more full and definite. But if we are not quite gratuitously to place an impassable gap between earlier and later stages we must assume that it is present, in however indeterminate a way, from the beginning.

§ 8. **Causal Unity.**—What has been already said of the other categories holds also in principle for causal connexion. Unless we assume from the outset that the primitive mind treats a perceived change which challenges its interest and attention, not as something self-existent in isolation, but as something conditioned by and conditioning other changes, it seems hopeless to attempt to show how this causal point of view could have arisen through any extension of know-

ledge in accordance with ascertained psychological laws and conditions. The only plausible suggestion is that it may have grown up through habitual association due to frequently repeated perception of similar sequences, *e.g.* the frequent perception that the placing of my hand in the fire is followed by a burn. But here we have the old fallacy of supposing that retentiveness gives rise of itself to fresh knowledge instead of merely preserving for future use knowledge already otherwise acquired. As Hume has pointed out with the greatest clearness and vigour, "from the mere repetition of any past impression even to infinity, there never will arise any new original idea . . . ; and the number of impressions has in this case no more effect than if we confin'd ourselves to one only."[1]

It might indeed be maintained that such customary repetition, though it does not itself account for the genesis of the category of causality, is yet an antecedent condition without which it does not actually emerge as a factor in the mental life. Even if this were true, the apprehension of causal relation would still be original in the sense which we have defined. It would not become operative until certain experiences had first been acquired, but these experiences would not account for it in accordance with known psychological laws. There is, however, good reason for denying that customary repetition is even required to furnish a first occasion or opportunity for the first emerg-

[1] Hume, pt. iii., sect. vi. As regards Hume's own view that the notion of causal connexion may arise, not through the development of knowledge concerning the changes themselves supposed to be causally connected, but through a peculiar effect produced by customary repetition in the mind itself, I say nothing, because this doctrine does not appear to have been seriously maintained by any later philosopher and because, in the end, it seems to have failed to satisfy even Hume himself.

ence of the apprehension of causal relations. For, as we have already insisted, the process of learning by experience is from the beginning experimental. Perceptual process involves throughout motor activity directed towards the fulfilment of practical interests in such a way that subsequent behaviour is continually adapted in accordance with the satisfactory or unsatisfactory results of previous behaviour in similar situations.

It is only through this practical initiative that customary expectations are in the first instance formed. Regularities are only found because they are sought. But it is in the seeking that the category of causal unity is primarily involved. The having learned by experience is a subsequent result which presupposes the previous process of learning; and the learning takes place only where there is attention, which is essentially a prospective attitude.

Consider the dog or cat in Mr. Thorndike's experiment previously quoted. The animal is confined in a box, with food outside. It can only escape by turning a wooden button, pulling a loop, or pressing down a lever. It struggles to escape in all kinds of ways, squeezing and biting and clawing. Ineffective modes of action are discontinued and give place to others, which in their turn are discontinued if they prove fruitless. If in this way the animal does accidentally work the mechanism, it is likely to do it sooner when again put into the box. Thus in repeated experiments "all the squeezings and bitings and clawings which do not hit the vital point of the mechanism . . . get stamped out, while the particular impulse which made the successful clawing or biting gets stamped in," until it alone is executed. This gradual adaptation of means for the attainment of ends involves in a rudimentary way the category of Causality. It involves the distinction between efficiency and inefficiency. It is the

starting-point and presupposition of all subsequent developments of thought which proceed according to this category.

But we must notice the essential difference which separates the merely perceptual category from that of ideational and conceptual thought. The perceptual category is always purely and immediately practical in its operation. It is a constitutive form of thought only because it is a constitutive form of action. The theoretical question Why? has no existence for the merely perceptual consciousness. It does not and can not inquire how it is that a certain cause produces a certain effect. It does not and can not endeavour to *explain*, to analyse conditions so as to present a cause as also a *reason*. It does not compare different modes of procedure or different groups of circumstances, so as to contradistinguish the precise points in which they agree from those in which they disagree, and in this way to explain why a certain result should follow in one case and a different result in another case. Causality in this sense can only exist where there are trains of free ideas, and the development of the ideational consciousness in this direction is a development of conceptual thinking—of explicit generalisation.

CHAPTER II.

Special Problems: Distinction of Separate Things and the Relation of a Separate Thing to its Sensible Appearances.

§ 1. **Introductory.**—The whole question of the detailed development of the perception of an external world is highly complex and intricate, and there are many points connected with it which are still obscure. We may, however, here select certain fundamental problems which appear capable of being treated in a more or less satisfactory way. (1) How is it that certain portions of matter come to be singled out and marked off from each other and from their surroundings as separate things? (2) How does the distinction arise between a thing thus singled out, and its varying sensible appearances? (3) What is the nature and what are the stages of the process through which the perception of spatial extension grows in distinctness and complexity? (4) How are initially separate data of different senses or of the same sense correlated with each other as attributes of the same thing?

These developments of perceptual consciousness really proceed coincidently and interdependently. They constantly condition each other and advance in one direction makes possible and is made possible by advance in others. But since we cannot say everything at once, we must take them separately for purposes of exposition. It is, however, to be borne in mind that in dealing with each

we are presupposing the others to be going on at the same time.

§ 2. **The Singling out of Separate Things.**—Our sensuous experience, at any moment, together with its acquired meaning, yields the apprehension of a certain total situation, a certain portion of the external world. But this total situation is normally broken up into those distinct centres of unity which we call "separate things." Thus, while sitting in my study, within the whole which is sensuously presented to me I can distinguish certain complex units as relatively independent, *e.g.* the pen I am holding, the desk I am writing at, this or that book, a match-box, a piece of blotting-paper, etc. This distinction by no means coincides with that between different portions of matter. Two portions of matter are distinct from each other when they occupy distinct portions of space. But each separate thing contains in this sense distinct portions of matter which are not distinguished as separate things. A pane of glass is apprehended by me as a separate thing, but the parts into which it would be broken up if someone were to smash it to shivers are not so apprehended.

A separate thing in all but the earliest stages of mental life is apprehended as combining within its unity a number of different attributes apprehended through different senses. We shall have to show subsequently how this synthesis of attributes takes place. But this is not part of our immediate problem. What we are here immediately concerned with is the *distinction* of separate things from their environment and from each other, rather than their internal complexity as involving a union of different attributes. We are concerned with the apprehension of what we may call *Thinghood.*

We have to inquire why this or that group of sensible qualities is separated from its surroundings and treated

as one thing. For ordinary common sense the world is mapped out into a plurality of these relatively independent units. Each of them emerges from its environment like an island from the sea. It is detached from its surroundings by its separateness and unity of interest. This interest is ordinarily of a practical kind; and the further we trace back the course of human development the more exclusively practical it becomes. It is true that for our highly complex consciousness the form of *Thinghood* has become very variable and fluctuating in its application. A stone is a single thing to a boy about to fling it at another boy. To the geologist examining its structure it may be several distinct things. It is nearly always possible mentally to break up what appears as one object into parts each of which has an identity and distinctness of its own. But we only do so in so far as the interest of the moment leads us to do it. The relativity and variability of our apprehension of *Thinghood* depends on this fluctuation of interest. In general, however, the division of the world into separate things is determined by more or less permanent and common interests of a practical nature. Thus if I were asked what things are in a room in which I happen to be lecturing I should say there was a blackboard, a desk, and so on. I should not begin to enumerate the dints and scratches on the blackboard, or the different planks in the flooring. I should be still less likely mentally to divide the uniform surface of the blackboard into different compartments and count each of these as a distinct thing. I should not do this unless I had a special interest to serve.

In more primitive stages of mental development, human interests are at once more exclusively practical in their nature and more limited in their range and less fluctuating. Hence for primitive man the division of

the external world into separate units called things is more fixed and absolute. But the limit in this direction is reached in the perceptual consciousness. Animals distinguish from its environment and treat as a separate thing whatever portion of matter appeals to their peculiar instincts and affords occasion for their characteristic modes of activity. Thus what is a separate thing for one animal is not so for another. The interests of each species are to a very large extent determined by the connate pre-dispositions which belong to it like other specific characters. What possesses unity and distinctness of interest to an ant is nothing to a cat, and so on.

There are, however, also more general conditions under which a thing may detach itself from its environment and become a separate centre of interest for the animal consciousness. Thus it may be a source of peculiarly intense sensations, or it may move in an obtrusive manner. Moving objects have a peculiar power of attracting attention. This is partly because the sensory experience which they produce is more intense than that produced by things at rest. But the chief reason is that a thing which moves in an obtrusive way challenges practical adjustment. There is need to run away from it, or at any rate keep a watch on it; for no one knows what it may do.

In general, whatever appears to perceptual consciousness as a separate thing does so because it is a relatively independent centre of interest. Whether this is so or not in the case of any given portion of matter depends, of course, in part on the special capacity, congenital or acquired, of the subject for being interested. But it also depends on conditions connected with the nature and behaviour of the external object itself. An indispensable though never of itself a sufficient condition is spatial

distinctness, the separate occupation of space in three dimensions. This primarily constitutes the difference between one part of matter or *body*, and another. Among further conditions we may mention as of fundamental importance: the repeated presentation of the same or similar parts of matter in various surroundings; change in the surroundings of an object while it remains apparently unchanged; change in it while its surroundings remain apparently unchanged.

The most important case in which some or all of these conditions are fulfilled is supplied by the perception of movement. When a body shifts its position relatively to its environment, while other bodies retain in perception their previous position relatively to each other, the moving object detaches itself for attentive consciousness from its environment, and becomes apprehended as a separable and therefore as a separate thing.

For each individual percipient there is one object, his own body, which fulfils, from the first and in the highest degree, all the requirements we have mentioned.

Consider, first, objective conditions. The complex of sensations actual or obtainable at will which yield awareness of the body, the body-complex as we may call it, is alone continually experienced while other presentations come and go. This happens, for instance, whenever the percipient moves from place to place. Thus the body of the percipient forms the persistent spatial centre in the shifting situations which he apprehends from time to time. Further, the members of the body may move relatively to each other or otherwise suffer perceptible change with little or no perceptible change in its surroundings. Conversely change in other presentations may take place independently of change in the body-complex. Finally, the body-complex is partly constituted by a

peculiar class of sensations, the organic, which remain blended in the original unity of sensuous experience instead of being broken up into a plurality of separate data and reconstructed in new combinations, like the presentations of the special senses, such as sight and hearing. These organic sensations form a central core, so that whatever other presentations blend with them are therefore included in the body-complex. The importance of this is shown by certain cases of hypochondria. "If, as sometimes happens in serious nervous affections, the whole body or any part of it should lose common-sensibility, the whole body or that part of it is at once regarded as strange and even as hostile."[1]

That the percipient's own body is to him an object of peculiar and continual interest is obvious. His interest in other percepts constantly includes interest in their relation to his body and especially in their position, distance, and direction relatively to it as a spatial centre. His motor activity needs continually to be adjusted to such relations and their changes, "the purpose of such movements being to bring near to his body" the things for which there is appetite, and to remove from it those for which there is aversion.[2]

The body, besides being thus the spatial centre from which the position, distance, and direction of other perceived objects are reckoned, is also most intimately and directly connected with the subjective life of feeling and will; so intimately that the awareness of self is primarily inclusive of the body so as to be the awareness of the embodied self. The pleasures and pains connected with organic sensation in early stages of development form almost the whole affective aspect of consciousness, and to

[1] Ward, *ibid.*, p. 598. [2] *Ibid.*

the end they remain of the greatest importance, playing a large part even in the higher emotions. But the pleasures and pains of organic sensation, *e.g.* the painfulness of a bruise or of hunger and thirst, or the pleasure of eating and drinking, arise in connexion with presented states and changes of the percipient's own organism and exist or at least persist independently of the variable environment.

Equally important is the unique relation of the body to the will. The only sensations over which the individual possesses or can acquire habitual and uniform control, so as to initiate, modify, or discontinue them at will, belong to the body-complex. They are all concomitants of his own unimpeded movements or of the contact of one part of the body with another. The voluntary initiation of change in other things or in their appearance to the sense is indirect and conditional.

Now it is a general principle that we normally apprehend as belonging to our own activity those means or instruments which are fully under our control instead of regarding them as belonging to the things acted on. In writing, so long as the pen does not splutter or make blots or otherwise assert its independence, I apprehend its movement as part of my own action—the action of writing. Again in riding a bicycle, as long as the machine is completely under my guidance I regard its behaviour as my own behaviour. I naturally say that *I* go down a street or turn a corner; I do not say that I make the bicycle do so. On the other hand, if it gets out of control it becomes sharply contrasted with my own action. On this principle, the motor and other sensations which occur uniformly and directly whenever the subject is interested in having them are not normally discriminated from the conations which condition them. Conative consciousness and its results are to this extent blended in the single complex experience

of motor activity. This means that awareness of the body and its behaviour is included in the awareness of the self and its doings.

Thus the growth of the distinction between the body of the percipient as a thing separate from other things coincides with the growth of the distinction between the embodied self and other parts of matter as spatially external to it and independent of it. This, again, makes possible another distinction of great importance—that between the qualities of things and their varying sensible appearances.

§ 3. **Distinction and Relation of Thing and Sensible Appearance.**—In our account of the primary datum of sense perception we began with the postulate that not only is sensation primarily apprehended as conditioned, but also that every difference and variation in sensuous presentation means for the percipient difference and variation in the related conditions. This may seem to exclude the possibility of the same object or at any rate the same attribute of the same object presenting different appearances to sense without itself undergoing change. Yet this variability in the sensible appearance of the same thing and of the same attribute of the same thing is a familiar fact. Water which feels hot to one hand may feel lukewarm to the other. Colour-sensations vary with the varying illumination, with the state of the retina and with other conditions apart from any corresponding variation in the thing seen. The same unvarying extension is very differently presented to touch and to sight; for touch, again, it varies with the part of the skin brought into contact with the object; and for sight with the part of the retina stimulated as well as with varying perspectives due to the varying positions of the spectator.

We may take as a typical example the familiar case of a stick partly immersed in a pool. The stick has the appear-

ance of being bent, whereas it is really not bent. Although it is not really bent the visual sensations through which we apprehend it are such as under ordinary circumstances would mean the presence of a bent stick. The visual presentation not only appears to have this character, but it does in fact have it The appearance to the eye really has a bend in it, though there is no bend in the stick. Take the stick out of the water and the visual appearance becomes straight; but the stick does not unbend. It does not unbend as, for instance, it gradually dries in the wind and sun.

Let us postpone inquiry into the psychological genesis of this distinction between a thing as it really is and its varying sensible appearances, and consider first what the distinction means regarded from the point of view of the developed consciousness.

The key to it is to be found in the division of matter into separate things each of which is from time to time singled out for special consideration. What we ordinarily call a perceived object is always such a separate thing. Originally every difference in sensuous presentation means a difference in its conditions. So far there is no room for the distinction between the change in a thing and change in its appearance. But it is otherwise when we come to the stage at which separate things are singled out by selective attention. For when we are considering a separate thing the sensations through which it is perceived need not be conditioned by the constitution of this separate thing in detachment from other parts of the material world. In fact, they never are merely conditioned in this way. The separate thing supplies only part of the conditions, and this part may remain constant while other conditions vary. Thus the visual appearance of a thing depends not only on the nature of the thing seen, but on whatever

affects the process through which light proceeds from it to the eye, and also on the state of the retina and brain at the moment of perception. In general, all other conditions are operative only in so far as they count as factors determining the way in which the body of the percipient is affected.

We may symbolise that part of the conditions which belongs to the constitution of the thing perceived as T. Other conditions may be symbolised as V. Then without change in T, there may be a series of variable conditions V_1, V_2, V_3, etc. $T + V_1$ yields the sensation S_1, $T + V_2$ yields the sensation S_2, $T + V_3$ yields the sensation S_3. Since T does not alter, the sensible quality of the thing remains the same throughout these variations of sense-experience. It is the same thing and the same quality of the same thing which is apprehended in diverse sensible appearances.

At this point, however, it is necessary to remind ourselves that we have no clue to the nature of the conditions of a sense-experience except in the sense-experience itself. Hence it is impossible to drop reference to the sensible appearance and consider only the constant factor T apart from it. What we do is to include the series of sensible appearances within the quality itself as phases of its existence; it belongs to the identical nature of the quality to have these variable appearances under varying circumstances. If it does not under appropriate conditions appear in these varying ways then it is no longer the same quality but has suffered change. If, for instance, the visual appearance of a thing did not increase in extensity as I approached, the extent of the thing would not be constant; it would be really shrinking in size as I drew nearer to it. A sensible quality is, therefore, to be regarded as a complex unity comprehending all the diversity of its appear-

ances. It may be symbolised by setting the constant condition T on one side of a bracket, and the whole series of sensations due to varying conditions on the other.

Thus, if we denote the yellowness of a certain orange by Yo, and the varying colour sensations we experience under varying circumstances by Ys_1, Ys_2, Ys_3, etc., and the constant condition by Yt, we have the following formula:—

$$Yo = Yt\begin{cases} Ys_1 \\ Ys_2 \\ Ys_3 \\ \vdots \end{cases}$$

Similarly, if we denote the extent of a thing by E, the extent as felt by Ej, and the extent as seen by Eq, and the constant condition by Et, we obtain[1]:—

$$E = Et\begin{cases} Ej \\ Eq \end{cases}$$

[1] The varying sensible appearances are, of course, not on the same level as regards the knowledge they yield. Some of them occur more frequently than others, and under conditions more easily ascertainable; we tend to use these as normal standards in preference to those which are more exceptional and obscure. For instance, in considering the colour of an object we tend to take as our standard its appearance to a normal eye in ordinary daylight. But besides such distinctions of relative convenience we also recognise difference in the relative accuracy of different appearances. Relations within sense-experience always mean corresponding relational order in the conditions of sensations. When, however, a glowing coal is rapidly whirled round, the resulting sense-experience is not a visual presentation rapidly changing its local sign but a circle of light. To the co-existence of the parts of this circle there do in fact correspond co-existent retinal impressions. But so far as the special object we are attending to is concerned there is not co-existence, but succession. Hence its visual appearance does not accurately express its nature. In this respect there is a very important distinction between the primary and the secondary qualities of matter. In the case of the secondary qualities, such as colour, odour, sound, taste, etc., the relations of sense-experience, which imply corresponding relations of the conditions of sense-

We have now, from the standing ground of critical reflexion, analysed the nature of the distinction of external things and their sensible appearances. We have next to pass to the specially psychological problem of tracing the development of this distinction at the perceptual level. But before doing so, we must first clear up a question concerning the use of terms. The word *appearance* has for its appropriate antithesis the word *reality*; and as a matter of fact we do inevitably contrast change and difference in things themselves as being real with change and difference belonging merely to their sensuous presentation as being unreal or merely apparent. In this sense our problem may be named the problem of the perception of *external reality*.

So far, we have avoided this language because without previous explanation it is likely to mislead. The perception of external reality is not identical with that of external objects or material things. It presupposes that external objects are already apprehended, however imperfectly, and it is concerned only with the distinction between difference and change affecting merely their sensible appearance, and difference and change in the things themselves.

In other words, the externality considered is a kind of externality relative only to the body of the percipient. Sensible change and difference are externally real if and so far as they are conditioned by the thing perceived independently of other conditions directly or indirectly affect-

experience, are mainly confined to likeness and difference. The primary qualities, on the other hand, consist in the spatial attributes of bodies, extension, motion and figure. Hence in their case the sensible appearance is accurate only in so far as it exhibits an order of position, distance and direction answering to that of the parts of the thing perceived.

ing the body of the percipient. As the body of the percipient is primarily apprehended as an embodied self, such externality appears as, in a sense, externality to the self.

In tracing the development of the distinction between sensible appearance and external reality, our main clue is the category of causality. This comes into operation in a two-fold way: (1) in connection with the motor activity of the embodied self in relation to surrounding things; (2) in connection with the perceived relation of these things to each other apart from the motor activity of the percipient. A connecting link between these two groups of experiences is supplied by cases of motor activity in which there is contact between the body of the percipient and the perceived thing and in which change in the perceived thing follows only in the overcoming of resistance by proportionate effort.

We have first to consider what we may call free or unimpeded motor activity. If I walk towards a thing, keeping it in view, my visual sensations change, as they would change if I had remained still and the thing itself had moved towards me or increased in size. If again I reverse my movement and recede from the object, I obtain the same series of changing presentations in reverse order; and this happens as often as I repeat or reverse the course of my motor activity. So, if I pass my hand to and fro in the same uniform way over the surface of a table, I regularly get the same series of touch-sensations, now in one order and now in the opposite order. Such changes, inasmuch as they are initiated, continued, discontinued, reversed, accelerated or retarded by corresponding variations of my own free motor activity and perceived variations in the position of my body or its parts, are apprehended as conditioned merely by change in me as an embodied self and not by change in the thing perceived. So far as the thing perceived is concerned they are regarded, not as real

changes, but only as changes of sensible appearance. On the contrary when similar changes occur apart from corresponding free movements on my part, I tend normally to apprehend them as involving real change in the thing perceived and not merely change in its sensible appearance.

Let us now turn to the case of impeded movement or movement against resistance. Here we have to disabuse our minds at the outset of the vague notion that there is some peculiarity in the nature of the sense-experiences involved which makes them the vehicle of a special revelation of external reality. The essential points to be considered are as follows: (1) the body of the percipient or part of it is in perceptible contact with something; (2) movement or the continuation of a movement already begun takes place only when what it is in contact with moves together with it in the same direction; (3) this occurs, if it occurs at all, only when the will to move has been followed by a certain degree of intensity and complexity in a complex of touch-sensations and muscle, joint, and tendon sensations. What we have to show is that the displacement of the thing which offers resistance must be apprehended as real, and not merely as a change in sensible appearance. This depends, in the first place, on the variability of the amount and direction of effort required in different cases. What lies within the free control of the agent is only the making of efforts in a certain direction and in a certain order. The result is relatively independent of this initiative. It varies with the thing which he pushes or pulls or otherwise attempts to manipulate.

But besides this there is another condition even more important. The perceptible changes which follow effort against resistance persist independently of the embodied self and its free movements. Unlike mere variations of

sensible appearance, they cannot, in any constant or uniform way, be continued, discontinued, reversed and renewed merely by continuance, discontinuance, reversal and repetition of the movements by which they are initiated. If I push a cup lying on a table away from me, I cannot merely by withdrawing my hand make it appear again in its original position. If I push it off the edge of the table it falls and breaks; the change which I initiate is continued into further change after my action has ceased and the final result persists for my perception independently of my movements. It persists as a condition to which my motor activity must adjust itself in order to be effective in subsequently producing other changes in the sensible appearance or in the independent reality of external objects.

In part, perceptible changes follow constantly and uniformly on the free movement of our bodies; in part, they follow on movements involving various degrees and directions of effort against resistance. But they also very frequently take place in the absence of any initiative on our part, as when a visual presentation shifts its position relatively to others while our head, eyes, and body remain at rest. In accordance with our general principle such alterations will be taken as real and not merely as alterations in sensible appearance.

But besides this mark of their independent reality, there is another which assumes increasing importance with the growth and gradual organisation of knowledge. The implicit operation of the causal category will lead the mind to seek for the conditions and consequences of such changes, whenever they are sufficiently interesting; and inasmuch as the conditions and consequences are not to be found in the motor activity of the percipient, they will be looked for in obvious changes taking place in other things external to his body. They will thus come to be referred to a causal

system of their own contrasted with that to which mere change in sensible appearance is due.

On the other hand, though this system excludes mere change in sensible appearance, it will include the perceived results of resisted motor activity, which we have called manipulation of objects. For the relations between the body of the percipient and other things involved in the overcoming of resistance by effort are in the main of like nature to the relations involved in their interaction with each other. If I push a billiard ball the ball rolls; but it also rolls when another moving billiard ball comes into contact with it. Further, the consequences following motor activity against resistance are constantly apprehended as continued into further changes due to the interaction of outside things with each other. If I push the first of a row of bricks, this, in falling, similarly pushes the second, and so on.

In general, real changes have presuppositions and consequences radically different from mere changes in sensible appearances; and we constantly use this causal difference as a criterion for distinguishing between them. To use Kant's illustration, when I glance from the top of a house to the bottom, the various parts of the house from above downwards are successively perceived; but I do not, therefore, regard them as successively coming into existence. One reason of this is that it is a pre-condition of the top existing that it should be supported by what is below it; otherwise it would fall.[1]

[1] Plainly Kant in his laboured "proof" of the principle of causality is throughout thinking of the distinction between real succession and succession in sensible appearance. He fails, however, to recognise that merely apparent successions have causal connexions of their own. He fails also to recognise that the whole problem only arises when we are considering what I call "a separate thing," in detachment from other things and its surroundings.

CHAPTER III.

SPATIAL PERCEPTION: (1) TACTUAL.

§ 1. **Nature and Conditions of the Problem.**—We have to inquire how spatial perception develops from vague and imperfect to more definite and perfect forms. The conditions of this problem are indicated by the results of an analysis of what is involved in the spatial extension of the external world as perceived and imagined and as ordinarily conceived by the developed consciousness. Such analysis reveals on the one hand a formal constituent consisting in a certain relational order of co-existence in the way of position, distance, direction. On the other hand, it is plain that spatial extension involves more than this relational order; it presupposes also something which is *ordered*; it presupposes items which are connected with each other in relations of position, distance, and direction—terms between which these relations subsist. The purely relational order is found apart from extension. When we sing a tune each of the successive notes has certain temporal positions and those that are not immediately successive have a certain temporal distance relatively to each other; there is also the distinction of temporal direction from what precedes to what succeeds. So with numerical series: 12 comes between 10 and 20 at a definite place in the numerical order, its direction relatively to 20 is contrasted with its direction relatively to 10, and it is nearer to 10 than it is to 20. If we take into account

fractions, surds, and other kinds of number recognised by mathematicians, there is no relation of position, distance, or direction, whether in space or time, which is not matched by a strictly analogous numerical relation.

A similar relational order is found in merely qualitative series such as those in which colour presentations may be arranged. For instance, in the series of intermediate gradations connecting pure blue and pure green, any blue-green or green-blue has a definite position, and a definite distance from other blue-greens or green-blues. If we select the interval between one blue-green and another as a unit, we may measure the distance between any positions in the scale in terms of this unit. But this series of qualitative gradations is not a line in space: it does not depend on the juxtaposition of the colours, but only on their differences and likenesses as revealed to attentive comparison. It may be represented as a line in space, but only by analogy. In itself, it has no distinctively spatial character. What fixes the position of any special colour in the series is its own intrinsic quality.

It would seem, therefore, that the distinctive character of spatial order depends on the peculiar nature of the terms which are connected by spatial relation—of the parts of an extended whole. What is this distinctive character? For certain purposes, it might be sufficient to say that spatial order is distinctively an order of co-existing terms as such. But this is certainly not enough from the psychological point of view. As psychologists we are concerned with conditions through which in the first instance an order of co-existence is *perceived*, not with the way in which it may ultimately come to be abstractly conceived by the metaphysician or mathematician.

Approaching the question in this way, we find that the definite apprehension of an order of co-existence, as such,

arises and develops only in connection with that peculiar aspect of sense-experience which we have called "*extensity*," and more especially the extensity of sight and touch. Two sounds or a sound and a smell may be presented as co-existent in the sense of being simultaneous; but taken by themselves apart from association with experiences of touch and sight, they are not apprehended as spatially juxtaposed or separated by a perceived spatial interval or as having perceived spatial direction and distance relatively to each other. Such relations can only be perceived or imagined, except perhaps in a very rudimentary way, when the external object is determined for us as an extensive whole by the extensity of the same presentation through which we apprehend it.

Further, it is characteristic of perceived and imagined extension that its parts do not require to be distinguished from each other by any difference except a spatial difference, a difference belonging to them only inasmuch as they are parts of an extended whole and not for any other reason. The parts of a visible surface are locally distinguishable from each other however uniformly similar they may be in colour. The same holds for a surface as touched, however similar it may be throughout as regards roughness and smoothness. The local distinction depends on the ultimate difference between simultaneous sensations which we have named a difference in local sign. Extensity is nothing but the continuous repetition or diffusion of local sign difference. Where simultaneous sensations of similar quality are not held apart by a difference of local sign they are not distinguishable from each other. Two stimuli which occurring separately would yield tone-sensations of identical pitch and timbre, produce when they are strictly simultaneous a single sensation of the same pitch and timbre, though of greater intensity. The perception of mere

difference in place with similarity in all other respects occurs only in sensations having extensity.

The presentational order of position, direction, and distance which conditions the perception of spatial relations in the external world is, therefore, primarily a relational order connecting the distinguishable parts of an extensive presentation—a local sign *continuum*. But it is equally clear that mere extensity is not of itself sufficient to yield the explicit apprehension of such relations between its parts. First touch the tip of the tongue and then the back of the neck with the square end of a match. The resulting sensations are in both cases extensive and through both of them we are aware of contact with an extended surface. But with the tip of the tongue the sensation is such that we perceive a surface as of a definite shape. For the back of the neck it is shapeless. Organic sensations have more or less extensity; they are more or less diffuse or restricted. But we have little or no apprehension of their shape or of the relative position and direction of their parts.

Such facts might be explained by distinguishing between cruder and finer forms of extensity. The cruder form which belongs, for example, to organic sensation, it may be said, exhibits only vague diffuseness without definite order, whereas the finer belonging especially to epicritic touch and to sight sensation does exhibit such an order. This distinction is probably valid if it be taken to mean that some kinds of extensity are and that others are not intrinsically capable of exhibiting the sort of relational grouping which we are considering. But the available evidence is strongly against the view that even the finer forms of extensity are of themselves sufficient to account for the perception of relative position, distance, and direction apart from the co-operation of other factors. This is shown by the ascer-

tained conditions of the perception of apartness in the case of skin sensation, *i.e.* the discrimination of two skin sensations as the limits of a felt interval interposed between them. Dr. Head's experiment of cutting through the sensory nerve fibres supplying the skin of his forearm proved that the perception of apartness is possible only for epicritic and not for "protopathic" or deep sensibility. But even epicritic sensibility cannot be sufficient by itself. For it fails to yield the perception of apartness when the limb to which it belongs has lost sensibility to muscle, joint, and tendon sensations. As far as regards the eye, we cannot appeal to such direct experimental and pathological evidence; but here also there are considerations which show unmistakeably that the apprehension of relational order within visual appearance is very largely, if not entirely, due to the co-operation of other factors than mere extensity.

If with one eye I look partly at the floor and partly at the wall of the room in which I am sitting, the visual appearance of the floor has for my perception a direction strongly contrasted with that of the wall. But it seems impossible to account for this difference of direction merely by reference to peculiarities in the extensive character of the retinal sensations which I receive in seeing floor and wall. Wall and floor both affect my eye through the light which they reflect. But the resulting groups of impressions due to the light proceeding from the floor and its parts, those which proceed partly from floor and partly from wall, and those which proceed from the wall alone, are spread out side by side on the surface of the retina in essentially the same way. Similarly, when with either one eye or two I look at objects situated in the far distance, there is nothing in the nature of the retinal sensation received at the moment which can of itself account for the apprehension of the lines

and surfaces as directed towards or away from the observer. There are no variations of retinal sensibility sufficient of themselves to account for the definite apprehension of the manifold varieties of solid figure.

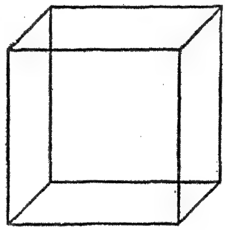
Fig. 1.

The same lesson is taught by the effect of perspective and shading and similiar conditions in paintings, drawings, and photographs. These factors owe their whole efficiency to their acquired meaning: and yet relative positions and directions of lines and surfaces as thus suggested obscure and displace for our apprehension what we call their real relation on the flat surface. Lines which are really divergent appear as parallel and lines which are parallel appear as divergent, so that it is often difficult or impossible to determine what their actual relation is without resorting to measurement.

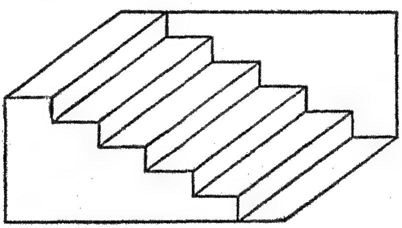
Fig. 2.

Cases of ambiguous figures are especially instructive. By an ambiguous figure I mean one which can be perceived alternatively in different ways. Thus the figure 1 may be

perceived at one time as having its highest line nearer the spectator and at another as having it further away than the bottom line. Similarly the figure 2 may be seen either as an overhanging cornice or as an ascending flight of steps. According as one or other alternative prevails the whole visual appearance is shot through with different lines of direction. Yet there is no difference in the extensity of the visual sensations immediately due to the way in which the retina is stimulated.

Considerations of this kind, which might be multiplied indefinitely, show that in very many instances at least the definite relational order of visual presentation as regards position, direction, and distance cannot be explained merely by reference to visual extensity, but presupposes also the co-operation of other factors. If we also take into account the proved inadequacy of mere extensity for tactual sensation, we seem justified in adopting as a provisional hypothesis the view that in all cases relational order is not an affair of mere extensity. The verification of this hypothesis will of course depend on our success in working it out in detailed consistency so as to account for the facts.

Mere extensity, then, whether crude or epicritic yields only a vague apprehension of the extension of bodies. It only in part supplies the conditions of the perception of definite position, distance, direction, and shape. The difference between the tactual experiences, according as a square surface or a circular surface presses on the skin, does not of itself account for the apprehension of the one as circular and the other as square. Such various modifications of extensity are indeed ultimately necessary for perception of shape; but they are not by themselves adequate, because they do not give definite apprehension of spatial order. For this we must also have recourse to some factor distinct from bare extensity. This factor must

show definite serial arrangement in the way of position and distance. It must also be so intimately connected with experiences of extensity that the definite arrangements which belong to it may be transferred to them: for it is not enough to have a pure experience of extensity externally conjoined with another experience showing a definite order of positions and distances and directions. Position and distance and direction must come to be apprehended as a relational order of the extensive whole itself.

As regards the general nature of this factor there is no room for doubt. It can consist only in experiences in the way of movement. But the word movement is here ambiguous. It may refer to motion sensations belonging properly to touch or sight occurring when a touch sensation progressively shifts its local sign within the general field of touch sensation, or a visual sensation shifts its local sign within the general field of visual sensation, *e.g.* when a fly creeps over the skin or when a flying bird crosses the field of view. These are motion-presentations.

But the reference may also be to the muscle, tendon and joint sensations which accompany the varying positions of the limbs. These are called motor sensations because they arise in dependence on the changing states of the apparatus by which the body and its parts are set in motion. Only part of the motor sensations have a distinct claim to be regarded as essentially akin to motion-sensations—those which arise through the joints sliding over one another. Both motion and motor sensations play an important part. But of the two, the visual and tactual motion-experiences ought probably to be regarded as of more fundamental significance in the first development of the apprehension of spatial order.

In any movement of the limbs or of the body as a whole, a series of varying sensations arises, due to the changing

conditions of muscles, joints, and tendons. Following Dr. Ward, we may symbolise such a series as P_1 P_2 P_3 P_4. "P_1 cannot be presented along with P_2 and from P_4 it is impossible to reach P_1 again save through P_3 and P_2"[1] or through some other determinate motor series. These motor experiences have therefore a definite arrangement. P_2 lies between P_1 and P_3. P_2 and P_3 constitute a distance separating and connecting P_1 and P_4.

Further, if the movement is not merely made in free space, but explores the contours of some object, there is another concomitant and corresponding series having definite arrangement. Suppose the instrument of exploration is the hand. As the finger-tips pass from one part of the object to another, there is a continuously successive series of tactile experiences having a definite order, and varying concomitantly with the sensations arising from muscle, joint, and tendon. If the object explored is part of the cutaneous surface of the body itself, there is still another definitely ordered series. As the finger-tip passes along the palm of the other hand, the contact is felt not only in the finger but in the hand explored. The successive stimulation of the parts of the hand yields a succession of local sign experiences which occur in a fixed order, and correspond to the succession of motor experiences. All these series have a definite arrangement of positions and distances: but the arrangement is not spatial. It is purely an order of time-sequence. Simultaneous spatial relations can only be perceived when the definite order is apprehended as the order of the parts of an extensive quantum as simultaneously presented.

It is essential to the possibility of this that the experi-

[1] Article "Psychology," *Encyclopaedia Britannica*, ninth edition, xx., p. 54.

ence of extensity and the experience of active movement should enter as co-operative factors into a process having unity and continuity of interest. A process having unity and continuity of interest leaves behind it as a whole a total disposition—a disposition to which each and all of its component factors in their conjoint interaction have contributed. This cumulative disposition is re-excited as a whole when the process is repeated in part. In this way the factors which enter into the process may become profoundly modified by their previously apprehended relations, so that each separately assumes a character which it has acquired from its connexion with the others. It comes to mean or stand for the others and to be modified by complication with them.

When an extensive experience has thus an acquired meaning due to its previous connection with a system of active movements, the extensive experience has become a perception of ordered extensity and therefore of ordered extension. If, on clasping an object in the hand, you know at once how to make a systematic exploration of its parts, so that you will have nothing to learn by actually executing exploring movements, then you have an adequate perception of its shape and other spatial determinations. If, on the other hand, mere contact with the object does not fully supply precise and definite guidance to the movements of exploration, the spatial perception is *pro tanto* inadequate. When the perception is adequate, any two local signs or any group of local signs prompts at once the appropriate movements for passing from part to part of the object. Extensity which has thus acquired meaning is no longer mere extensity, but a continuous complex of positions and distances. Just as the passive touch acquires in this way a properly spatial significance, so the active touch which is at first a purely successive series, also acquires

a spatial character. As the finger-tips pass over an object, the successive tactile experiences do not present themselves as merely a time-sequence. They become for consciousness the successive presentation of a whole of co-existent parts.

If we inquire what the appetitive processes are into which extensity and active movement enter as co-operative factors, we may answer by referring to all the primitive activities by which the ends of animal life are secured. Such practical activity can only be effective in so far as active movement is delicately adjusted to the shape, size, distance, etc., of objects. The guiding clues to such motor adjustment can only be found in touch- and sight-experiences. But just in so far as the touch- or sight-experiences either originally possess or subsequently acquire the power of guiding active movement, they are or become perceptions of spatial order.

We have now at once to explain and to justify these general statements by an account of the special conditions by which the development of (1) the tactual, (2) the visual, perceptions of spatial order is determined.

§ 2. **Spatial Perception of the Blind.**—The existence of blind persons enables us to study touch-space dissevered from sight-space. But it is essential for this that the blind persons should either be blind from their birth, or have lost their sight in the first year of their lives.[1] Those who have become blind in their fourth year translate their tactile impressions into visual imagery as we ourselves do in the dark.

It must be understood that the observations and experiments on which we rely are all made on blind

[1] The facts adduced in this section are largely due to Theodor Heller's most valuable "Studien zur Blinden-Psychologie" in the *Philosophische Studien*, xi., 1895, pp. 226, 406, 531.

persons who have already acquired considerable experience. Their spatial perception is therefore at the outset developed in some measure. What we can observe therefore is only the process by which greater precision and accuracy are acquired. It is fortunate for psychological purposes that spatial perception by touch frequently does not reach full maturity with nearly the same rapidity as spatial perception by sight. Hence even in the adult blind, it is possible to observe it in the process of growth.

The chief instrument used by the blind in perceiving the shape and size of objects is the hand, or rather the two hands. These are used in a two-fold way. (1) The hand, either open or closed, may touch simultaneously the parts of the object. This may be called *passive touch*, because it does not involve active movement from one part of an object to another. It may also be called *synthetic touch*, because it yields a total simultaneous impression of all or many parts of the object. (2) A portion of the hand, such as the finger-tips, may explore the parts and contours of the object by gradually moving over them. This may be called *active touch*, because it essentially consists in active movement. It may also be called *analytic touch*, because it analyses or breaks up into a series of successive impressions what synthetic touch presents as a simultaneous whole. Now the main lesson that we learn from study of the blind is that development in the definiteness of the perception of spatial order is essentially due to the intimate union and co-operation of synthetic and analytic touch.

The first question with which we have to deal is, What information concerning shape and other spatial determinations is conveyed by synthetic touch apart from analytic? Of course, we cannot bring synthetic touch into play in absolute severance from analytic, for we are considering

persons who have already had considerable experience in the exploration of objects and especially of their own bodies. In the case of simple and familiar things which they have already often explored by active touch, they can at once recognise shape, size, etc., by merely passive contact. But when objects are presented to them with which they are quite unfamiliar, it is found that for precise apprehension analytic touch must be combined with synthetic. Synthetic touch alone without the aid of previous experience yields at the most a general and schematic total impression. For instance, they can tell whether the object is round or angular, and whether it is regular or irregular. But for more precise determination of its shape, analytic movements are required. It is particularly noteworthy that the blind are almost incapable of confining themselves to purely synthetic touch when the object is at all unfamiliar. Involuntary twitchings of the hand occur which they find it difficult or impossible to suppress.

In the active exploration of objects there is a great difference in the method of procedure in different persons, and in different stages of development of the same person. The more highly the spatial perception has been developed, the more systematic and appropriate are the movements and their combination. At the highest stage the blind use a plan of procedure identical in its main features in different individuals. This is sometimes acquired in early childhood where the conditions are favourable. If the blind have to work with their hands, they always acquire the power of apprehending simple spatial relations. On the other hand, adults of otherwise good intelligence, who have not been compelled to acquire control over objects by pressure of practical needs, often show great helplessness,

and do not appear to have any interest in spatial relations. In such cases, a special education of perceptual activity is required for adequate apprehension of the shape of objects. As education advances, the blind person becomes more and more capable of determining the size and shape of objects presented to him. At the same time, his active movements of exploration show a more and more systematic and purposeful character.

In higher stages of development the process of analytic touch takes a form such as the following. One hand holds the object in position, and turns it so that it may be conveniently explored by the other. Finger and thumb are the instruments of exploration, and they are used simultaneously. The finger glides along one contour of the object, and the thumb along an opposite contour. The varying distance of finger and thumb, as they proceed from their starting-point, measures and determines the distance and direction of the boundary lines. If finger and thumb retain the same relative position, the boundary lines are parallel; if they move apart, the boundary lines are divergent; if they approach each other, the boundary lines are convergent. When in this process of analytic exploration the object is pushed backwards till it touches the surface of the hand, analytic touch passes into synthetic. The two hands sometimes interchange functions, and at intervals synthetic touch intervenes, the object being clasped and pressed. As a rule, synthetic touch comes first, and introduces analytic. All active exploration is brought into connexion with the total presentation of the object, as it exists for passive touch. The more practised a blind person is in the apprehension of the configuration of bodies, the more rapid and sketchy are the active movements necessary for adequate perception. Indeed, all

the facts show that neither active nor passive touch alone suffices. The perception of spatial order is a product of their union and interaction. This co-operation of synthetic and analytic touch is possible only for objects small enough to be taken in the hand, or at least in both hands. Larger objects cannot be apprehended as a whole by synthetic touch. Active movement, it would seem, must in these cases be the main resource. But this is not quite true. The blind person can often measure the dimensions of the object by the dimensions of his own body, comparing, for instance, its height with his own height.[1] The significance of analytic touch as applied to larger objects depends upon the significance which it has acquired in co-operation with synthetic touch. Some blind persons are unable to acquire precise spatial apprehension of those objects which cannot be immediately clasped by the hand. This inability manifests itself in their movements of active touch, which are for the most part limited to the discovery of some striking and distinctive feature of the object which can serve as a sign of it. But it is often possible to induce these persons to undertake a systematic exploration of larger objects in the way of active movement, by putting before them models of these objects on a reduced scale. They are thus prompted to compare originals and copies. Afterwards they freely apply the system of movements thus acquired to all objects which require and admit of them. As in the active exploration of small objects the convergence and divergence of thumb and finger play a prominent part, so in the exploration of larger objects the convergence and divergence of

[1] We shall presently have to consider the conditions under which the spatial relations of the body itself come to be presented.

the two arms is of the greatest value. There is a link of connexion between these two methods, inasmuch as it is possible to use either of the two methods for smaller objects. A thing may either be taken between the opposing thumb and finger-tip or between the opposing fingers of the two hands.

So far, we have dealt with the exploration of comparatively limited spaces. We have kept within what may be called the *touch horizon*. This is very much more restricted than the visual horizon. Its utmost limit is the space that can be embraced by the outstretched arms. Larger spaces than these can only be explored by locomotion of the whole body, in which extension previously presented is completely left behind. We thus have a series of fragmentary presentations. For fully precise spatial apprehension these must be gathered together into a single simultaneously presented whole. It is conceivable that this might be effected by mental images of the parts not immediately perceived. To a certain extent the blind may actually proceed in this way. But they can only do so by reproducing the whole on a reduced scale. The scale of their imagination is limited by the range of their actual perception. The same is true of those who can see. We cannot mentally visualise a spatial expanse larger than the field of view as given in actual perception.[1] If we are to include in the purely mental field of view objects beyond the range of actual vision, we must make a schematic representation of them on a reduced scale. Those who are confined to the sense of touch may follow an analogous plan; but their power in this respect

[1] Of course we can think of such an expanse, although we cannot picture it.

varies with the individual, and is in any case very much more restricted than that of persons who can see. We must not, however, suppose that where the apprehension of the parts of a spatial whole becomes purely successive, the parts themselves are presented as successive, so as to transform a spatial perception into a temporal perception. On the contrary the movements of exploration have already acquired a spatial significance through the experiences obtained within the limits of the touch-horizon. Hence the parts of the spatial whole which successively present themselves are apprehended as related in the way of co-existence, although they cannot be simultaneously presented. Similarly, a person who can see, in walking along a road for ten miles, has a number of successive fields of view which cannot be simultaneously presented either actually or ideally. But he does not apprehend these fields of view as forming a time series: he apprehends them as successively presented parts of a co-existent whole. The reason for this will become clearer in the sequel.

§ 3. **Localisation and Projection.**—For the developed consciousness skin-sensations have a double function. On the one hand, they inform us of the extension of the surface of our own body and of the shape and the relative position, direction, and distance of its parts. So far as this is the case, skin sensations are said to be localised. On the other hand, they inform us of the shape and the relative position, direction, and distance of bodies external to our own. So far as they do this, they are said to be projected.

The terms projection and localisation have become established by usage. But they are apt to mislead. For they tend to suggest that we begin by referring skin-sensations to the skin itself as their seat, and that in afterwards

referring them to things outside our body we undo this original connexion and, so to speak, throw them outwards. That this is a fallacy is sufficiently indicated by the parallel cases of visual and joint sensations. Visual sensations are not originally localised in the retina; they reveal nothing of the shape or size of the retina or of the spatial position and other relations of its parts. Further, they never come to be localised, like tactual presentations, because for this a special system of experiences is required which in their case is absent.

The distinction between localisation and projection is a distinction of acquired meanings and not an original datum of tactual perception. Projection distinctively and primarily depends on the system of experiences connected with the active movements whereby we explore the surface of things external to our own bodies, as when I pass my hand over the surface of a table; also, in a less degree, on the motion of outside things over the surface of our bodies while we remain relatively passive, as when a fly creeps over my cheek. Localisation distinctively and primarily depends on active movements by which one surface of the percipient's body explores another, as when I pass my hand over the surface of my arm or my legs rub against each other.

The processes through which localisation and projection develop are distinct; but they are by no means isolated. On the contrary they continually condition and support each other, each advance in localisation making possible further advance in projection and inversely. In particular, the progress of localisation is of the highest importance for the full development of projection.

§ 4. **Projection.**—Let us first consider projection apart from localisation as it might proceed if the skin like the retina were incapable of exploring itself. I lay the palm

of my hand on the surface of a table. In so doing, I experience an extensive complex of sensations, emphatically different from any I should be experiencing if my hand were not pressing against such a surface and also emphatically different from those I should be experiencing if my hand were in contact with my own body. As such a complex possesses extensity it will, of itself, yield a crude awareness of extension, independently of acquired meaning and complication.

But the perception of apartness, shape, and definite spatial order requires to be otherwise explained. How does it arise in the first instance? Suppose that I move my hand over the surface of the table. Part of what happens is that new tactual sensations gradually emerge and at the same time others cease. This is a point to which we shall presently recur. But, besides this, sensations previously experienced continuously shift their local signs. For example, a touch-sensation having originally the local sign distinctively dependent on contact with the tip of the middle finger comes to have the local sign distinctively dependent on contact with some part of the ball of the thumb and in the process of transition successively acquires a series of intermediate local signs.

Any tactual presentations within the extensive whole may in this way, by means of appropriate movements, progressively shift their local signs so as to acquire those originally belonging to any others within the same extensive complex. Here, then, we have precisely that awareness of mutual relation between extensity and motion which is required for the growth of the perception of apartness, direction, and distance—of a rudimentary spatial order.

So far, I have considered only skin-sensations—an extensive tactual field and changes of local sign within

this field. But movements of active exploration also involve, besides the motion which is merely an affair of cutaneous sensibility, corresponding series of motor experiences due to muscle joint, and tendon. Of these, the joint-sensations at least are akin to touch proper and change as a limb moves in a way akin to the shifting of the local signs of tactual sensation.

The motor sensations in general and more especially the joint sensations render very important help in giving definite awareness of apartness, position, distance, and direction within the extensive field of tactual experience and therefore within the extension of the external object. At the same time they become complicated with the tactual experiences so as to acquire a meaning which persistently clings to them even when the corresponding series of skin sensations is absent. They come to mean, even when they occur by themselves, extension, position, distance, and direction. Thus, when my hand passes over the surface of the table and beyond it so that experiences due to contact with it cease, I am still aware of space traversed, though in this case of empty as distinguished from filled space.

This seems fully accounted for by two conditions: (1) The category of spatial unity which leads the mind to apprehend any given bit of extension as only a *bit*, and therefore as having a continuation beyond itself; (2) the meaning acquired by motor-sensations through their union with tactual extensity and tactual motion.

I have, for the sake of clearness, referred only to one simple and primitive example of the mode in which the perception of spatial order may be acquired. But of course the same essential conditions may be varied in endless ways and endlessly repeated in each of them. In particular the alternate interchange of passive or synthetic contact with a surface as a whole and the successive

exploration of its parts one after another is of the greatest importance in all but the earliest stages of development. After touching a surface, as a whole, with the palm of my hand, I may raise my hand so as to leave only the tip of one finger in contact with it, and then I may explore one by one with this finger the parts which I had previously touched all together; or I may first touch it as a whole with one hand, then explore in detail with the fingers of the other, and so on. In such processes, the variations of sense-experience due to free movements, are referred to sensible appearance only; hence the surface of the external object is throughout identified as the same.

Besides the continuous shifting of the local signs, active exploration of the surface of a body also involves the progressive incoming of new presentations together with the disappearance of those previously experienced. If, as Berkeley supposed, we were aware only of the sensuous presentations without mental reference to their conditions, the result of this would be merely an apprehension of a temporal sequence of sense-experiences, not of an order of co-existence. It would not convey the perception of the parts successively touched as persisting and co-existing in contrast to the transience of the sensations as they begin and cease.

That in fact we do apprehend in this way the ordered co-existence of the enduring parts of the external object is due to the following conditions. (1) Sense-experience originally means the existence of connected conditions, and the relational order of sense-experience means a relational order of those conditions. (2) The kind of motor activity by which we pass from one part of a surface to another, inasmuch as it does not involve the overcoming of resistance by effort, is regarded as determining change in sensible appearance rather than change in the thing per-

ceived. (3) The emergence and disappearance are gradual: we have, for instance, to begin with the simultaneous group *a*, *b*, *c*, *d*, *e*, *f*, then *b*, *c*, *d*, *e*, *f*, *g*, then *c*, *d*, *e*, *f*, *g*, *h*, etc. (4) The category of spatial unity is throughout operative, leading the percipient to look beyond any given bit of extension for its further continuation.

As regards the perception of a third dimension, we have already noted that though this is primary, it differs radically in nature from the perception of surfaces. So far as it is primary, it is inseparably bound up with the apprehension of spatial unity. We are initially aware of it inasmuch as we are aware of surfaces as being only surfaces, *i.e.* boundaries of solid extension. We are aware of any bit of surface not merely as continued beyond itself superficially, but also as continued into a third dimension. This is the germ from which the perception gradually grows. Further development depends on increasingly definite and detailed apprehension of the relative position and direction of different surfaces and of their varying shape as flat or as curved in various ways.

This development, so far as it is connected only with exploration of outside things and not with the spatial apprehension of the percipient's own body, is essentially dependent on motor sensations and their acquired meaning. If I pass my hand over the surface of the table to its edge and then beyond it so that contact with the table ceases, I am still aware of the extension previously perceived as continued in empty space. But there is an indefinite variety of alternative continuations according as my hand moves in various possible ways. Thus the edge of the table comes to be apprehended as a common boundary of many diverging surfaces, all of which have a common continuation on the surface of the table.

Again, motor series differ in marked ways according to

the shape of the surface explored, according as this is flat or spherical, concave or convex. All such differences as they emerge are interpreted with reference to a third dimension on the analogy of the relation of limiting lines within a surface to the superficial extension which they bound. As, for instance, a circle is enclosed by its circumference, so a spherical surface encloses a sphere.

Apart from muscle, joint, and tendon sensations, there are also highly important differences in the feel of different kinds of surfaces. But these variations of merely tactual sensibility do not of themselves suffice to yield awareness of shape and direction in the third dimension. They only come to do so through meaning acquired by them in connection with motor presentation. There are marked differences of tactual sensation according as my finger tip presses the level surface of a table or its edge or the round surface of a billiard ball. But the difference arises merely from the varying distribution of intensity of pressure. When I press a level surface, resulting touch-sensations are of approximately equal intensity. When I press the surface of a billiard ball, the extensive complex of tactual sensation has a central part of maximum intensity round which other sensations gradually decrease in intensity. Such variations will not of themselves originally suffice to give the apprehension of the shape of surfaces. But they come to do so by association with experiences of active movement, much as varying distributions of light and shade come to signify for the eye variations of solid figure in things seen.

§5. **Localisation.**—All the conditions operative in the exploration of outside things are also operative in the exploration of the percipient's own body. But other factors also come into play, and these are of the utmost importance. In the first place there is the doubling of

sensation due to the fact that when part of the skin comes into contact with another both surfaces are sensitive. There are thus for every such contact two extensive presentations which appear, disappear and persist together, and vary in intensity concomitantly with each other.

The consequences of these double contact sensations are immensely important as regards acquirement of meaning. Each of the two groups of tactual experiences acquires spatial meaning, as it would in the exploration of things outside the percipient's own body. All that we have said in dealing with projection applies here also. But, besides this, the associations which each would acquire separately are through their constant union permanently communicated to the other as well. If the right hand alone were sensitive and the left insensitive then tactual exploration of the left by the right would yield only perception of the extension and spatial order of the left; the sense-experiences connected with the right hand would not thereby come to yield perception of its own extension and spatial order; nor could this be supplied by the left since the necessary sensations are absent; for the same reason, the left hand could not come to feel its own extension and spatial relations. But owing to double contact experiences the mutual exploration of the two hands gives an essentially different result. The skin sensations connected with each come to mean not only the extension and spatial relations of the other, but also its own. Further, the spatial awareness of the surface of the skin itself due to its own sensations persists however these sensations may be excited. When once acquired it accompanies the sensations due to contact with things outside the body.

It depends on circumstances whether we attend especially to the spatial relations of the thing touched or to those of the skin which touches it. When the body touched

is relatively interesting as requiring practical adjustment or for any other reason projection predominates over localisation. When, on the contrary, it does not demand practical adjustment and is of too uniform and familiar a character to excite interest through its comparative novelty, localisation predominates over projection. We do not, for instance, usually take notice of contact with our own clothes or with the surrounding air, even when we move through it. Indeed we usually treat the surrounding air as if it were empty space.

In the case of organic skin sensations such as those due to a blow, localisation is emphatic, though it is also accompanied by distinct projection at the moment when the sensation arises through the action of an external body.

To understand the full significance of this awareness which we have by way of skin sensation of the extension and spatial order of the surface of our own bodies, we must take another point into account. The whole sensitive surface of the skin is normally the source of sense-experiences apart from what we ordinarily call contact with external bodies. This is in part due to unnoticed contacts which escape attention through their uniformity and familiarity, *e.g.* those with slight currents of air or with our clothes. It is also in part due to inter-organic conditions, such as the circulation of the blood.[1]

Whatever may be the operative conditions, it is at least true that we have only to attend to any special area of the cutaneous surface in order to detect the presence of touch, temperature, and organic sensations. Many of these

[1] Perhaps we ought to assume that, as in the case of the eye, apart from stimulation by light, there is also visual sensation, due probably to central, not to retinal conditions, so there are touch sensations, due to similar conditions, apart from external stimulation.

are comparatively feeble; but others are emphatic, *e.g.* the organic sensations of itching or tickling, or those which persist as the after-effect of a bruise or a burn. Marked after-sensations also frequently follow the motion of an external body over the skin in the path which it has traversed.

This continuous presence of a total extensive field of skin sensation gives rise to a combination of passive or synthetic with active or analytic touch which is not found in exploration of bodies external to the percipient's own organism. In the case of external bodies, active exploration of the parts of a whole, and simultaneous contact with the whole, cannot co-exist; so that synthetic and analytic touch can only come into play alternately; but when the finger-tip passes over a surface of the skin, we have not merely a series of successive touches, but also a persistent field of cutaneous sensation corresponding to the whole of the surface explored. By continual exploration of the body in various directions, this background of synthetic touch acquires a spatial significance. There thus arises a direct sense-perception of the configuration of the body and its parts which is always with us, whatever other spatial perception we may or may not have at any moment. This primitive spatial presentation of our own bodies is of great importance as a preparation for the perception of spatial relations in external bodies. Owing to it, both synthetic and analytic touch as applied to external bodies have a spatial significance which they would not otherwise possess.

§ 6. Influence of Localisation on Projection.—This aid and reinforcement which projection derives from localisation assumes manifold forms too numerous to discuss in detail. It will be enough to refer to some points of cardinal importance.

Consider the act of grasping an object between finger

and thumb. When the object grasped is a part of our own organism, such as the hand or the leg, the skin surface which lies between the contact of the thumb and the contact of the finger is itself the seat of cutaneous sensation which has acquired spatial significance. Thus the interval between finger and thumb is directly perceived as an extended whole by synthetic touch. The extension is greater or less according as the thumb and finger are more or less widely apart. Hence, when an external body is taken between finger and thumb, the interval between them and the variations in the amount of this interval are already perceived as a spatial interval having varying degrees; and this must contribute to give greater definiteness and precision to the perception of spatial distance in the thing touched.

Further, when one part of the skin comes in contact with another, the area touched is apprehended as part of a wider area surrounding it; or rather of two wider areas surrounding it. For instance, when the palm of one hand is laid upon the palm of the other, the area of contact is apprehended both as a portion of the total surface of the right hand and arm, and as a portion of the total surface of the left hand and arm. When the palm of the hand is applied to an external object, the area of contact is immediately perceived by synthetic touch as part of the total surface of the hand and arm. It is not directly apprehended by synthetic touch as only a portion of the surface of the external body. But previous experiences of the kind in which one hand is laid on the other must constitute a certain preparation for regarding the area of contact as a portion not only of the body surface, but of the surface of the object touched; and it must therefore help to give significance to the active movements by which other parts of the external object are explored.

Measurement by superposition has its psychological beginning in localisation and the union of localisation and projection. To be aware of superposition is to be aware of two surfaces as spatially related in such a way that there is no distance between them. Now the distance of a surface outside us from the surface of our body is roughly measured by the series of motor sensations required to give certain touch-sensations. When the touch-sensations occur the continuance of free movement occasions their disappearance. Hence at the time of their occurrence the surface of the external thing is apprehended as being at no distance from the surface of the skin touching it. But this presupposes that through the same extensive group of tactual sensations we have at once a perception of the surface touched and of the skin touching it as coincident with one another.

The fact that it is the self-same sensations which yield the apprehension of both surfaces as separated by no distance accounts for their being apprehended as identical in size. Thus when I place my hand on the table I am at once aware of the extent of surface touched as equal to that of the surface of the hand touching it. When one part of the skin is in contact with another, there are two groups of sensations each of which yields perception of both surfaces, and of both surfaces as having no distance between them. Such measurement by superposition enables us to allow for the variation of extensity for different areas of the skin, so that we refer this to sensible appearance rather than to external reality.

It is plain that the perception of spatial relations in the third dimension is immensely helped by our perpetual awareness of the surface of our own body and the spatial order of its parts. Out of the endless ways in which this takes place we may select a few by way of illustration.

When my hand presses the surface of an external body the resulting sensations yield at once the awareness of the surface of the body touched and of the surface of the hand, with no intervening distance. If, now, I raise my hand, I am aware of the separation of the two surfaces with a greater or less distance between them marked by motor sensation. But this distance, inasmuch as it is a distance between surfaces, as such, in contrast to a distance between parts of the same surface, must be apprehended as an interval in the third dimension, an interval of solid space. The same holds good for the contact and separation of areas of my own skin, except that in this case I continue throughout the process to have a separate perception through appropriate sensations of both surfaces. When my hand is partially closed, so that the thumb is touching the index finger, I perceive each surface directly, each through its own sensations, and also through those of the other. If I now separate finger and thumb, I still have a perception, through actually present sensation, of both; and I am aware of their surfaces as separated by an intervening tract of tri-dimensional space, greater or less according to the motor sensations which accompany the movement. In this way, each group of muscle, joint, and tendon sensations which I may experience at any moment comes to mean for me a certain relative position and distance of finger and thumb.

Let us now suppose that finger and thumb hold between them a marble or ball or other solid body. Then the distance between them as determined through motor sensations means the distance between the opposite surfaces of the thing which they grasp. Again, suppose that we stretch out a hand so as to touch something in front of us; the distance of what is touched is measured by our awareness of the length of the outstretched arm; it is an

arm's length away. Finally, the extension and shape of our body as a whole and of each of its members can only be apprehended as extension and shape in the third dimension. It is a surface returning on itself so as to form a closed figure. But a surface returning on itself so as to form a closed figure can only be apprehended as bounding off a solid space enclosed within it from a solid space surrounding it. This perception of our body as solid is also made more vivid by the extensity of organic and motor sensations which yield the vague apprehension of surfaces inside it.

§ 7. **Congenital Dispositions for Spatial Perception.**— It is clear that to a very large extent the apprehension of a spatial order in the way of position, distance, direction, and shape arises in the way we have described through a union of extensity with motion experiences and motor experiences. It may still, however, be questioned whether it is entirely to be explained in this way. All that we can say is that apart from definite evidence to the contrary we have a right to assume that the same principle which covers the facts so far as we can trace them also applies when direct means of testing it fail.

But it does not follow, even if we assume that all perception of spatial order is acquired, that it must therefore be acquired entirely by each individual percipient for himself. It has frequently been maintained, especially by Herbert Spencer, that the individual starts his own development with an initial equipment due to the inherited dispositions formed through the experience of his ancestors. On this view, retentiveness operates in the transition from generation to generation, in a way essentially analogous to that in which it works in the development of the single individual. The hypothesis is attractive. But from the biological point of view it is at least very doubtful whether

we are justified in assuming the "hereditary transmission of acquired characters," *i.e.* characters acquired by an individual in the course of his own life-history.

The prevailing view is rather that the parent organism transmits to its descendants only such characters as belong to it at birth, and not those special modifications which it acquires for itself. Hence it is not safe to assume that ancestral experiences can be retained and revived in subsequent generations as an earlier experience is retained and revived in subsequent experiences of the same individual.

None the less, there is no doubt that congenital predispositions do play a most important part in the growth of spatial perception. The development depends on the union of extensive experience with active movements. But we have seen in discussing Instinct that animals are born with a congenital equipment which leads them to perform more or less complex and definite series of movements under appropriate conditions without having to learn them by experience, and that they are born with a strong impulse to such motor activities which again does not need to be acquired by previous experience of consequences. The chick, for instance, in emerging from its shell, pecks at suitable objects. This does not necessarily imply that it is aware, from the beginning, of the distance, situation, and direction of the objects. But the experiences which accompany instinctive actions of this kind are just those which are required for the acquirement of the perception of spatial order. Nature intervenes from the outset as a teacher supplying the animal with appropriate material for learning the needful lesson; it also supplies from the outset a special interest and a special power of retentiveness.

These last factors are of peculiar importance for the

higher animals, and, above all, for human beings. The congenital preparation in human beings does not usually take the form of ready-made and precise adaptation for complex series of movements. What we find in a rudimentary form in them is more of the nature of general tendencies to certain kinds of motor activity, *e.g.* walking, running, articulate utterance, and a peculiar ability for learning to perform such movements in varying special ways. This ability includes a special capacity for being interested in certain directions, and a special power of retentiveness in the same directions. It is because of such specialised interest and retentiveness that learning by experience is so very rapid and its results so permanent in the first years of childhood.[1] There seem however to be, besides, certain eye-movements which are congenitally definite.

[1] It should be noted that what is congenital in the human being does not necessarily appear in the new-born infant. The nervous system of the new-born infant is very far from being fully grown. Much comes to it by mere physiological growth as distinguished from learning by experience. The same is also to some extent true of the new-born dog and other higher animals, though the growth in this case is much more rapid.

CHAPTER IV.

SPATIAL PERCEPTION: (2) VISUAL.

§ 1. **General.**—There is no difference in principle between the process by which the visual perception of space is developed, and that by which the tactual perception is developed. Both depend on a combination of analysis and synthesis. Active sight corresponds to active touch, and passive sight to passive touch. There is however this important difference, that in the case of sight synthesis and analysis are much more intimately combined. They are for the most part simultaneous rather than successive. We have in the eye an expanded surface sensitive to light, but near the centre of this surface there is one spot in which visual sensation is peculiarly delicate and distinct. Thus there is at any moment of vision a general field of view seen by the eye as a whole, and a limited area within it seen with peculiar clearness and distinctness by the central spot, called from its colour the yellow spot. Within the yellow spot there is a pit or depression called the *fovea centralis*, and here discrimination is most delicate of all. Now, active sight consists in movements of the eye which successively bring the outlying parts of the field of view within the area of distinct vision. A certain amount and direction of movement is required in order that a stimulation situated in a given position in an outlying part of the retina may be transferred to the yellow spot. Thus by a highly organised system of definite movements the eye is perpetually passing to and fro within

the field of vision, bringing its parts successively into the area of distinct vision. The development of spatial perception, as dependent on sight, is coincident with the perfecting of these movements, and of others connected with the co-operation of the two eyes.

Though the visual and tactual perception of space depend on essentially similar conditions, there are specific peculiarities in the case of sight which require separate treatment. In the first place, visual perception of space cannot be adequately discussed unless we take into account its relation to the tactual experiences which arise in the actual manipulation of objects. The spatial perception is throughout its development determined by practical interest. The object of perception is ultimately always *real* extension, figure and magnitude; but these are much more directly and accurately revealed in tactual experience than in visual. Variations of the visual experience are constantly occurring, which imply no variations in the size, figure, and position of the objects seen, but only variations in the position of the body or eyes of the observer.

In the second place, the eye has means of perceiving the third dimension which are denied to touch. This arises from the fact that the eye is stimulated by objects at a distance from the body.

§ 2. **Advantages and Disadvantages of Sight as compared with Touch.**—Sight as a means of spatial perception has the following disadvantages as compared with touch.

(1) The conditions of localisation as distinguished from projection are absent in the case of the retina. One part of the retina cannot explore another so as to get double visual sensations comparable to double contact sensations. Hence light and colour presentations never yield any perception of the extension of the retina itself, its shape, or the spatial arrangement of its parts.

(2) The surface of the retina is not in direct contact with things seen. Hence there is great and incessant variation of visual appearance for things of the same size and shape according to their varying distance and direction from the eye and the varying conditions of illumination. Whatever makes a difference to the light on its way from the thing perceived to the eye makes a difference to the resulting sensation.

(3) The movements of the eye are restricted; it turns upward and downward or to right and left, and in intermediate directions; but it cannot move away from the head as the hand can move away from the body. This deficiency is of course partially compensated by movements of the body as a whole or by moving the head backwards and forwards.

(4) The motor apparatus for the eye has no joints and therefore its movements are not accompanied by joint sensations. Hence, apart from retinal experience itself, they are mainly appreciated by the tactual sensations due to the rolling of the eyeball in its socket. The evidence seems to show that discrimination by this means alone is relatively vague and inaccurate. Finer discernment depends on sensibility to changes in the local sign of visual presentations as the eye moves.

On the other hand sight has the following advantages over touch.

(1) *Comprehensiveness.*—The field of view has a vastly greater range than that of touch, inasmuch as it usually includes sensations from a vastly more extended portion of the external world.

(2) *Greater delicacy.*—Visual sensibility is more finely differentiated than tactual sensibility.

(3) The use of two eyes yields a peculiar system of local signs of great importance for the distinction of the positions

of objects before and behind that point of the field of view which is most distinctly seen at any moment. These local signs are due to the local sign fusion which takes place when a sensation belonging to one eye coalesces with a sensation belonging to the other in a single sensation without local distinction.

(4) In the case of the eye there are many and various sensible appearances which through constant association come to signify spatial relations, although they do not directly and essentially contribute to the process through which such relations are first apprehended, *e.g.* the distribution of light and shade and geometrical perspective.

Balancing advantages against disadvantages we may say generally:—

(*a*) The disabilities of sight render it incapable of developing an adequate spatial perception independently of touch and movements of tactual exploration; also in the end the data of sight are tested in cases of doubt by those of touch. Spatial perception starts from and is ultimately referred to a tactual base.

On the other hand (*b*) as visual perception develops, it yields an apprehension of spatial relations far wider in range and more delicately discriminative than is possible for touch alone.

The problems which require discussion in the case of sight are mainly connected with the perception of spatial relations in the third dimension. But we shall first deal with the relative parts played by sight and touch in the perception of the directions, up and down, right and left.

§ 3. **Distinction of Up and Down and of Right and Left.**—It is a well known fact that the image formed on the retina by the light proceeding from the things we see is inverted. Rays from the lower part of the object fall on the upper part of the retina and inversely; rays from the

right side of the object fall on the left side of the retina and inversely. Yet visual appearances are not perceived as upside down or with their left side on the right and right side on the left. The reason is that the distinction of right and left and of up and down is primarily due to tactual exploration and is for the eye an acquired meaning. It is true that the directions which we name in this way are distinguishable through visual experience and eye movements. As the eye turns upwards or downwards, retinal impressions progressively shift their position in opposite ways with correspondingly contrasted series of changes of local sign of visual sensation. This is enough to yield the apprehension of two contrasted directions. But it does not of itself account for these directions being felt as upward and downward; and the same holds for the distinction of right and left.

It has been suggested that one direction is felt as upward because we have to move the eyeball upward in order to obtain the required series of local sign changes and that for the like reason the opposite direction is felt as downward. But this view has been refuted by a very interesting experiment carried out by Mr. G. M. Stratten.[1] By wearing glasses suitably constructed he obtained retinal images for his whole field of view which were not inverted. In other words, his visual sensations were such as they would have been if all visible objects had been turned round through an angle of 180°. The result was at first bewilderment and almost total inability to adjust himself and his actions to his environment, except in so far as he succeeded by an effort of memory in recalling the usual appearance of familiar objects. Their actual appearance seemed to him dreamlike. He was aware of it as mere

[1] *Psychological Review*, vol. iii., No. 6, vol. iv., Nos. 4, 5.

sensible appearance in contrast with external reality. But he gradually learned to guide his movements directly in relation to his novel experience and so to correlate and harmonise the data of sight and touch. So far as he succeeded in doing this without effort and sense of strangeness, he ceased to apprehend the new visual appearances as inverted. He felt as if he were looking upwards when he moved his eyeballs downward and he felt as if he were looking to the right when he moved his eyeballs to the left.

The whole experiment shows that the distinction between up and down, as such, and that between right and left, as such, primarily belong to touch and are for the eye acquired meanings. This may prepare us for finding in other cases that what now seems to be directly seen really presupposes the co-operation of vision with tactual exploration.

§ 4. **Secondary means of Spatial Perception by the Eye.**—Setting aside, for the moment, the peculiar system of local signs due to the conjoint use of two eyes, the visual sensations produced by things seen at different distances do not vary as regards extensity in any other way than those produced by things at the same distance. In both cases there is the same kind of difference in the size and outline of the retinal impressions. Further, the eye cannot move out of its socket away from the body. With a reservation, to be noted presently, connected with the use of two eyes, the eye movement from near to far is the same as the eye-movement from lower to higher. How are these initial disabilities overcome so as to yield the apprehension of spatial relation in the third dimension which we have even when we use only one eye? As a first step towards answering this question we may begin by noticing the manifold secondary means of spatial perception which are plainly from their very nature due to acquired association only.

There are, as I have already indicated, highly complex and multiform conditions which play a most important part in our developed visual apprehension of spatial order, but which cannot be regarded as original factors directly and essentially contributing to it. So far as spatial perception has already developed in other ways they suggest it through association, but they are not presupposed in its first acquisition.

Among these secondary conditions we may especially note the following:—

(*a*) The varying magnitude of visual appearances. When we know or are by any motive led to assume that the thing seen has really a certain fixed size, the variable bigness of its visual appearance comes through association to convey the perception of varying distance from the body of the percipient. The larger the visual presentation the nearer the thing; the smaller the visual presentation the farther away the thing. If we look at a man through the wrong end of a field glass the visual appearance is diminished in size, and as an immediate consequence the man looks just as if he were at a great distance. It is just as if we actually saw a man at this distance.

To appreciate the full importance of this condition, we must remember that all the objects within the field of view and the different parts of the same object produce retinal impressions varying in extent in a systematic and regular way according to their distance from the eye. The imitation of this systematic diminution of size with increasing distance is in the hands of the artist a most potent means of producing stereoscopic effect. Where the varying distance of an object is fixed by other means, the extent of the retinal impression mainly determines perception of magnitude. This is well seen in the case of after-images. "Produce an after-image of the sun and

look at your finger-tip; it will be smaller than your nail. Project it on the table, and it will be as big as a strawberry; on the wall, as large as a plate; on yonder mountain, bigger than a house. And yet it is an unchanged retinal impression."[1] An actual thing producing a retinal excitation of the same extent would vary in size according to its distance. Hence the imaginary thing suggested by the after-image appears of different sizes, when it is perceived at different distances. But the actual retinal sensation is in all cases the same.

(*b*) Certain solid figures of a familiar type present characteristic and easily recognisable visual appearances and, especially, characteristic relations of their boundary lines. Such characteristic outlines come through association to suggest corresponding solid shapes.

(*c*) The distribution of light and shade. The mode in which light is intercepted varies with the shape of the solid object on which it falls. The distribution of light and shade among the parts of the object itself is also determined by its shape. Thus the play of light and shade is exactly opposite in the case of a hollow mask and a projecting face. This "modelling," as it is called by the artist, takes the most subtle gradations, according to the various minute hollows and elevations in the surface of an object, as for instance in the folds of drapery. Besides this, what is called the "cast-shadow," viz. the shadow thrown by an object as a whole, plays a very important part. "Objects in a landscape stand out much better in morning and evening light when strong and distinct cast-shadows are thrown, than in noonday light."[2]

(*d*) Vividness, distinctness, and modifications of colour-

[1] James, *Psychology*, vol. ii., p. 231.
[2] Sully, *Human Mind*, vol. i., p. 252.

ing. The brighter is the visual appearance, and the more sharply and minutely its details are distinguished, the nearer it appears, in the absence of counteracting conditions. As I gaze from my window across the sea towards a strip of coast on the other side of a bay, I find that on a clear day this looks much nearer than when the air is misty. Similarly, persons leaving the foggy climate of England for the clear atmosphere of the Swiss Alps or the Arctic regions find themselves greatly under-estimating distances.

Differences of colouring may have a like effect. If two mountains are seen in the distance, and one appears bluish, and the other green, the green is perceived as nearer. The green of the vegetation is only visible at a certain distance; at a greater distance it gives place to a blue tint derived from the intervening air.

(*e*) Another condition is connected with the changes of local sign of visual presentations which accompany movements of the eyes or head. This change is more rapid in proportion to the nearness of the thing seen. In travelling by rail, the nearest objects seem to fly past us with great rapidity; those further away move more slowly; and the most distant appear by contrast to be moving the other way in the same direction as the train. In general, the varying rapidity of the displacement of visual appearance as the eyes, head or body move has come to signify varying distance from the percipient.

(*f*) Varying accommodation of the lens of the eye. The nearer the object, the more convex must the surface of the lens be, if a distinct image is to be focussed on the retina; and the more remote the object, the flatter must it be. If the lens is too convex or too flat, what are called "circles of diffusion" occur on the retina, and the image is indistinct. Thus, in fixing the eye successively on more

and more distant points of a line, the lens will be accommodated at any moment for the point looked at and yield a distinct image of this. Points nearer or more remote will produce progressively more indistinct and diffused impressions, the greater is their distance from the fixation-point. As the glance moves to and fro along the line, the indistinct becomes progressively distinct, and *vice versâ*. This helps the perception of position and distance in the third dimension. The adjustment of the lens depends upon a muscle which by its contraction slackens a ligament to which the lens is attached. When the ligament is slackened, the lens, owing to its own elasticity, bulges and becomes more convex. There are motor sensations accompanying this process of motor accommodation.

These associative conditions do not themselves enter into the constitution of the perception of depth, but are able to reproduce it when it has once been formed by other means. It is frequently said that they are signs which the mind interprets. Such phrases are only permissible if we are careful to explain the nature of the signs and of their interpretation. Usually when we speak of interpreting a sign, it is implied that the sign is itself distinctly and separately noticed, and that the interpretation is an additional and distinct act of thought. But this is not the case with the perceptual signs which we have been discussing. They themselves are in the main ignored, and only their meaning is attended to. They have no independent existence for consciousness apart from their meaning. The meaning being inseparably one with the sensations that are its signs, has the immediacy, the obtrusiveness and the fixity of impressional experience.

The association works by reviving, not free or explicit, but tied or implicit ideas. When we look at a man

through the wrong end of a field-glass, we do not first notice that the visual appearance is small, and then proceed by a separate step to entertain the suggested idea of his being far away. Rather we see him as if he were far away from the outset. It is only through reflective analysis that we infer his apparent remoteness to be something suggested by association and not an original datum of perception.

Though such associative factors do not directly contribute to the first development of the perception of spatial relations in the third dimension, yet in all but the earliest stages they play a very important part indirectly. They do so because they enable us to retain, recall and utilise the results of previous development.

§ 5. Primary Monocular Perception of Shape and Distance in the Third Dimension.—Though our perception of spatial relations in the third dimension is decidedly less precise and accurate with one eye than with two, yet it is plainly of the same nature. There must, therefore, be some way of accounting for it without reference to the special conditions of binocular vision.

Bishop Berkeley was the first to advocate a theory according to which all spatial perception of shape and distance in the third dimension is entirely due to tactual and motor experience, so that the eye only supplies secondary signs of the kind which we have just enumerated. This theory contains an essential truth. The tactual perception of extension does play a great and indispensable part in modifying and, so to speak, *moulding* the visual perception. But it is quite wrong to regard sight, even in monocular vision, as supplying nothing but merely secondary signs, such as the distribution of light and shade.

According to Berkeley, when we perceive a thing as at a distance from the eye, our apprehension of its distance is

primarily due merely to the tactual and motor experiences which we have had in the past in walking up to things so as to come in contact with them. The results of these past experiences are, he says, suggested by such secondary associative conditions as distinctness, light and shade, size of visual appearance, etc.; and this constitutes the perception of "outness" by the eye.

A very important point is here omitted. The experience of going towards a visible object so as to get contact with it includes, together with tactual and motor presentations, a concomitant and correspondent series of visual presentation in such a way that the distinction between extension as felt and extension as seen comes to be interpreted as only a distinction of sensible appearance and not of external reality. Through this constant and intimate union the spatial order and direction in the third dimension, which belongs originally only to the tactual-motor series, is acquired by the visual series also. Thus the field of visual sensation itself becomes grouped and ordered so that some parts of it are perceived as directed outward, others to right and left, others in intermediate directions.

The presentation of visual extension depends primarily for its value on its intimate correlation with extension as revealed to touch. There is between them a unity of practical interest, in which the tactual element plays the dominant part. In practice, they are perpetually combined. In exploring a thing by touch, the eye follows the motion of the hand. In so far as sight comes first, it is constantly followed by touch, and is useful only in so far as it guides touch. Now this intimate union cannot exist without mutual modification, and since the tactual experience more directly reveals real extension, the modification of the visual experience will be the more profound. To explain what we mean by this modification, let us con-

sider its influence in the formation of mental images. A man handles an object in the dark. As he explores the outlines of the object, he at the same time constructs a visual image of it. The visual image is throughout determined by tactual experience. With each feature of tactual extension there is correlated a corresponding feature of visual extension. The visual image is throughout moulded by the touch. Now we are here concerned, not with visual imagery, but with visual perception; not with free, but with tied ideas. What we say is that owing to the frequent and intimate union of tactual with visual perceptions, the visual perception, when it exists without the tactual, will be moulded by previous tactual experiences, much as the visual image of an object in the dark is moulded by a present tactual experience. This is only a special application of the general principle which underlies the whole development of the spatial perception. In the development of the tactual perception of space passive or synthetic touch acquires a certain serial order and arrangement of parts from its connexion with active and analytic touch. In like manner, the visual perception of extension acquires a certain order and arrangement of its parts from its connexion with the tactual perception of extension. It would thus appear that though the eye had no independent means of apprehending those relations of surfaces and lines which pre-suppose the third dimension, it would none the less become capable of apprehending them in some degree through its intimate practical union with touch. The whole process is a case of complication.

There is still, however, a gap in our explanation. When and so far as the visual experience exists before the tactual, as when we look along the surface of the ground, stretching away from us, without actually walking over it, or when we see a cube or sphere without touching it, how

do previous tactual experiences come into play so as to determine the perceived order and direction of sight-presentations? Obviously there must be, in each special case, distinctive peculiarities in the visual experience itself to suggest them. But there is no difficulty here. We have already indicated what these distinctive peculiarities are. They consist in all those variable features of visual presentations which we have brought under the head of secondary associative factors, varying size of visual appearance, distribution of light and shade, distinctness and indistinctness, recognition of familiar outlines, difference in rapidity of displacement of visual appearances as the eyes, head, or body move, accommodation of lens, and other conditions of a similar nature.

The results of the previous co-operation of sight and touch are, so to speak, deposited in the keeping of those secondary factors so as to be recalled and utilised as occasion requires.

We have now given an account of the conditions of spatial perception which would be operative if we had only one eye. But the use of two makes it decidedly more precise and adequate. Further, even our apprehension of spatial relations with one eye only is no doubt helped in ordinary cases through associations formed in binocular vision. It has even been maintained that the monocular perception of solid figure and of varying distance in an outward direction mainly depends on such associations. But, as we have shown, this is an unnecessary hypothesis; and it seems to be sufficiently refuted by cases of persons who for many years or virtually for their whole lives have depended on one eye alone.

§ 6. **Binocular Perception.**—Whenever we look at a point so as to bring it within the area of most distinct vision for both eyes, we receive from it two impressions,

one affecting each eye. But the result is a single presentation of the object. This is so because similar impressions fall on corresponding points of the two retinas. The two points of most distinct vision constituted by the *foveae centrales*, or central pits, correspond to each other in this way, so that light-impressions falling on them give rise to the vision of a single object. Other points of the two retinas also correspond when they are symmetrically situated with reference to the central pit.[1] In general, the left half of one eye corresponds to the left half of the other, and the right half to the right half. Thus a point in the left half of one eye will correspond to a point in the left half of the other when both have the same situation relatively to the centre of distinct vision. If the retina of one eye could be applied to the retina of the other, so as to superpose the nasal half of each on the temporal half of the other, their points of contact would be, roughly speaking, corresponding points. Single vision normally occurs when corresponding points are stimulated in a similar way. But it also occurs when the points thus stimulated do not exactly correspond, but when the deviation from correspondence, or *disparateness*, as it is called, is small. When this happens there is a single presentation, but it appears as lying behind or before that area of the field of visual sensation which is most distinctly presented. When the disparateness between the points affected is relatively great, double vision may result.

If a finger is held between the eyes and an object, and if we then fix our eyes on the object so as to bring it into the centre of distinct vision, we see the finger doubled. The greater the distance between the finger and the object,

[1] This statement is not quite exact; but the correction required is unimportant for our general exposition.

the wider apart are the two images of the finger. If the right eye is closed, the left image disappears; if the left eye is closed, the right image disappears. This is crossed disparation. If now, instead of fixing our gaze on the object, we fix it on the finger, the finger is seen as single, and the object as double. The greater the distance between finger and object the wider apart are the two images. When the right eye is closed, the right image disappears. When the left eye is closed, the left image disappears. This is uncrossed disparation. The experiment succeeds with most people, but not with everyone. There as some few who can hardly be brought to see things double at all. But even these, if their vision is really normal, will in all probability be able to see a double image of such a bright object as a lighted candle. The special conditions of the experiment are that the eye should be fixed on one object, and the attention fixed on another, either beyond it or in front of it. Apart from these special conditions, it would appear that double images are not ordinarily noticed by normal persons. When the eyes are moving in a free and natural way from object to object, and attention is concentrated only on what is seen in the area of distinct vision, double images are not discerned. It should be carefully noted that when vision is distinctly doubled, the distance of the two images from the object which is distinctly seen is vaguely apprehended. We may see it now at one distance and now at another, either arbitrarily, or in consequence of some casual suggestion. So far as the distance is precisely apprehended, our perception of it may be referred to other conditions than the disparate position of the two impressions on the retinas of the two eyes. It would seem that this disparateness either yields a precise perception of distance, or a double image, but not both at once.

The same facts are well illustrated by the stereoscope. In looking through this instrument there is set before each eye only a surface and not a solid figure. It is not the same surface which is set before both eyes, but a separate one before each. On these surfaces there is outlined a drawing of the same solid object, but the one surface presents it as seen from a point of view to the left, the other from a point of view to the right. The one figure represents the solid object as seen by the right eye, the other as seen by the left, when both are fixed on it. The result is the presentation, not of two superficial delineations, but of one solid object. The reason is, that when the two eyes are respectively fixed on corresponding parts of the two outlines, other parts of the field of view produce disparate impressions on the retina, just as they would do in looking at the same point of the actual object. The further they lie behind or before this point in the actual object, the more disparately situated are the impressions they produce, and the same is the case in looking through the stereoscope.

The solid effect in the stereoscope is greatest when the eyes are allowed to move freely from one point to another. But it is also unmistakably present when the illumination by which the two pictures are seen is so transient as not to allow time for movements of the eyes. Of course, as the eyes fixate one point after the other of the apparently solid object, retinal impressions which have been previously disparate come to affect corresponding points, and those which previously affected corresponding points become disparate. The appearance of solidity is more distinct and impressive, the fewer are the double images discerned. Old and practised experimenters, who concentrate their attention with the view of finding double images, become in time unable to obtain the stereoscopic effect They see only a flat surface.

Now there is a theory which would regard the above statement as a complete account of the binocular perception of solid figures. Distance from the area of distinct vision, behind or before it, is supposed to find its full and ultimate explanation in the disparateness of the position of like impressions in the two retinas, the degree of distance corresponding to the degree of disparateness. This view seems plausible if we consider visual perception in its fully developed form. It does not appear that any other conditions can be operative when the two slides of the stereoscope are lit by a momentary illumination which allows no time for movements of the eyes. But when movements of the eyes are thus excluded, the stereoscopic effect is comparatively dim and imperfect. It must also be borne in mind that when in ordinary vision we steadily fixate a single point in the field of view, and attend to objects before or behind it, we obtain double images rather than a perception of distance from the point fixated. These facts point to active exploration by movements of the eye as an important factor in the perception of the third dimension.

An even more powerful reason for tinroducing this factor is the general analogy of the way in which the spatial perception develops. The apprehension of tactual space develops through a co-operation of active and passive touch. What we know about children, and about persons blind from early infancy who have recovered their sight by an operation, shows that the same is true of sight. In a case of operation for congenital cataract,[1] a boy could not count even as few as two objects by means of passive sight, although he had learnt to count by means of touch.

[1] Uhthoff, "Sehenlernen blindgeborener und später mit Erfolg operierter Menschen," in *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, Bd. xiv., Heft 3 und 4.

When two objects were placed before him, and he was called on to say how many they were, using sight only, he could do so only by fixing his eyes on each of them in turn. At the outset, it was necessary for him to point to each of them successively with the finger. Pointing without touching was sufficient. At a later stage he was able to count merely by fixing his glance on each object in turn. This he did at first not by movements of the eye, but by lateral movements of the head. It was not till much later that he learnt to count a number of objects at a single glance. In all cases of this kind, the perception of distance in the third dimension develops very gradually. At the outset, the patient appears to have only the analogies of his tactual experience to guide him.

We may then assume that active as well as passive vision is required for the development of the perception of the third dimension. In principle, this development takes place in a way precisely analogous to the development of the spatial perception in general. When the eyes are fixed on any point in the field of view, those parts of the field which lie behind or before this point are perceived by means of disparate retinal impressions. If and so far as the disparateness does not give rise to double images, it gives rise to a peculiar modification of visual sensation, varying concomitantly with the nature and degree of the disparateness. Thus there are differences in the passive sensibility of the retina corresponding minutely with the varying distances of other objects from the object which is at any moment fixated by the two eyes. Thus we have given in the way of synthetic or passive sensibility the material for the perception of the third dimension.

But this synthetic and passive experience can only acquire spatial order in which its parts become positions separated and connected by distances, when active sight successively

explores the data simultaneously given to passive sight. Active sight takes the form of increasing or decreasing convergence of the two eyes. When the eyes are turned inwards, so that the lines of vision [1] converge, objects nearer than the point first fixed by the eyes, which have for that reason previously produced disparate impressions on the retina, come to produce impressions on corresponding points. Decreasing convergence has the same effect for objects lying beyond the point originally fixated. This process is perpetually going on in every moment of waking life; and it is perpetually required for practical adjustment to the environment.

Hence the two co-operative factors, active or analytic and passive or synthetic vision, must combine to form a total disposition, which is excited as a whole by each of them. In this way each acquires spatial significance which it would not have in isolation from the other. The peculiar qualitative differences due to varying disparateness of the retinal impressions become perceptions of relative distance from the point on which the eyes are fixed and the combined movement of the two eyes becomes for consciousness a movement over a tract of space.

In this way we may account for the perception of relative distance from the visual presentation which is most distinct at any moment. But the question still remains, How is the distance of the fixation-point itself determined? In the first place, by all the factors which are operative for one eye. But besides this, whatever determines the relative distance of other points from the fixation-point must also determine the relative distance of the fixation-point from these other points. Thus all objects intervening between

[1] The line of vision is an imaginary straight line connecting the *fovea* and any point to which the gaze is directed.

the body and the eye contribute to fix the absolute distance from the body of the point distinctly seen.

There is also another factor operative in a greater or less degree—the sensations due to the varying position of the eyes themselves. There are no joint-sensations because the muscles of the eye do not work on joints. But this defect is to some extent compensated by the tactile experiences due to the movement of the eye in its socket; and muscular sensations proper are probably contributory factors. Thus the varying degrees of convergence will be marked by varying tactual and motor sensations in the eyes. These will also help to mark varying direction and extent of movement. But it should not be forgotten that the movements of the eyes, whether in the way of convergence or otherwise, are optical as well as motor experiences. They are accompanied by displacement of impressions of the retina. In converging movements, disparate impressions are in process of becoming correspondent, and *vice versâ*. It has been shown by Professor Hering and others that this purely optical process admits of greater delicacy of discrimination and therefore is a more important factor, in our experience of movement and position of the eyes, than the motor sensations of the eyeball.

Binocular local signs, together with movements of increasing and decreasing convergence, give rise to an awareness of the order and direction of visual presentations and therefore of external objects. But are they sufficient, independently of touch, to constitute our normal apprehension of relative nearness and farness from the body of the percipient?

To answer this question we must first remind ourselves of the result reached in the analogous case of right and left, up and down, as perceived by the eye. There are, as we saw, distinctions of purely visual direction corresponding

to these distinctions. But we also found cogent reason for holding that the opposition of visual directions is not felt as the contrast between right and left, up and down, except in so far as the data of sight are correlated and co-ordinated with the data of touch. There is therefore a strong presumption that the same holds for the directions from near to far and from far to near. If physical and physiological conditions were such that movements of increasing instead of decreasing convergence were required for clear vision of objects which for touch are more remote, and if movements of decreasing instead of increasing convergence were required for clear vision of what for touch are nearer objects, the visual direction which is now felt as from near to far would be felt as from far to near, and inversely.

This result is confirmed by other facts which indicate the ultimate subordination of even binocular experience to tactual data and to sight as educated by touch. Where in accordance with the special binocular condition of the perception of solid figure we ought to see a human face in inverted relief, we fail to do so. The normal appearance of the human face obtrudes itself in spite of the binocular system of local signs which, if they were effective, would transform its projections into hollows and its hollows into projections. This seems hard to explain if we suppose that the binocular apprehension of the directions from near to far and from far to near, as such, depend only on retinal experiences and the motor sensations of the eyeballs, independently of meaning acquired by association with other visual data and ultimately with tactual data.

Even more important is the fact that the binocular fusion of disparate impressions so as to yield a single sensation is itself to a large extent determined by associative suggestion. It is not true that fusion and non-fusion depend only on anatomical conditions—on the degree of disparateness of the

retinal impressions. Retinal impressions equally disparate may or may not fuse. Whatever in accordance with past experience tends to suggest that we are looking at a single thing favours fusion; whatever tends to suggest that we are looking at two things works to prevent fusion. In combining drawings in a stereoscope we may at first see them only as superposed on a flat surface with their component lines remaining distinct. Yet, if we merely add a line tending to suggest solid figure such as we are familiar with, we obtain the stereoscopic effect. Further, in certain cases of squinting and in others where the shape of the retinal surface has been altered by disease, the patient begins by seeing double where he had previously seen single, and then gradually learns to see single again. Finding, in constant experience, that his double images really correspond to single things he acquires the habit of fusing them in a single visual presentation. This dependence of binocular fusion on associative suggestion is hard to explain except by assuming that the specially binocular perception of spatial relations does not stand apart by itself, but is conditioned throughout by its correlation with other experiences and ultimately with touch and tactual exploration.

§ 7. **Correlation of different Sensible Qualities as belonging to the same thing.**—The most essential conditions for dealing with this problem have already been referred to in treating of spatial relations and of the distinction between sensible appearance and external reality. Why is the same flame perceived as both bright and red? Because the brightness and colour-quality of the visual sensation have the same local sign. Why is the same surface apprehended by touch as at once smooth and dry and cool? Because we fail to distinguish different extensities for the corresponding skin-sensations. Why are a certain

colour, on the one hand, and a certain smoothness and coolness, on the other, all referred to the same portion of matter as its qualities? Because we regard them as having an identical place. We do this because we have learned, under appropriate conditions, to identify extension as felt with extension as seen, treating their distinction as a distinction of sensible appearance and not of external reality. Why, in the first instance, do we refer an odour, sound, or heat to a certain body which is at a distance from us? Because the corresponding sensations increase as we approach it, diminish as we recede from it, and reach a maximum when we are close enough to touch it.

Besides these conditions we must also take account of the causal interaction of things with our own bodies when we overcome resistance by effort and of the analogous causal relations of things with each other. Changes which affect a group of qualities together, either as regards their spatial relations or otherwise, tend to be regarded as changes in the qualities of the same thing. When a piece of paper comes in contact with a flame and burns, the resulting change affects permanently its appearance to all our senses. It also makes a similar difference to the further changes which it is capable of undergoing or producing. It will not, for instance, burn again as it did before.

Attention to interactions involving real alteration as distinguished from mere variation of sensible appearance, yields the apprehension of a most important class of attributes, those which have been called by Locke active and passive powers. These consist in modes in which certain bodies can be counted on to behave when brought into certain relations with other bodies. Wax, for example, melts and clay hardens in contact with fire.

CHAPTER V.

TEMPORAL PERCEPTION.

§ 1. **Introductory.**—The apprehension of temporal relations, as they exist for human consciousness, is an extremely complex product of mental development. The part played in it by trains of free ideas is of predominant importance. Without such trains there could be no such thing as the definite apprehension of a time-series, having a distinguishable beginning and end, connected by a train of intermediate events, each having its own position in the series determined by its relation to other events which come before and after it. For perceptual consciousness it is evident that time cannot exist in this form. On the other hand, we find in perceptual consciousness those primary experiences on which our developed apprehension of time is ultimately based.

§ 2. **Immediate Experience of Time-Transience.**—The perception of extension depends ultimately on a certain immediate sensuous experience, *extensity*. That of time depends also on a certain character of immediate experience. Not, however, on a character confined to certain kinds of sensuous presentation, but on one belonging to immediate experience in general. Within our conscious life change and transition are constantly taking place. Presentations wax and wane in distinctness and intensity, and give place to each other; attention is shifting; conation is constantly undergoing vicissitudes of relative success and failure with their affective accompaniments. Now the bare

fact of the existence of such change is in itself irrelevant to the problem of time-perception. The essential point is that the transition involves a peculiar immediate experience which we may call the experience of transience. When we are in the darkness and an electric light is suddenly turned on, it is a quite inadequate account of what takes place in us merely to say that first we have darkness-sensation and that immediately following this we have light-sensation. It must be added that the transition itself from the one to the other is *felt* in its own peculiar way. What is experienced is not mere darkness and then light, but darkness passing into light. It is ultimately this transience-experience which conditions the thought or perception of the fact that a change is taking place, whether the change is apprehended as occurring in our own presentations or in external objects. There could be no awareness of what is expressed in the proposition, experience *b* follows experience *a*, if there were not also the peculiar experience involved in the passage of *a* into *b*. Without an immediate change-experience, "cognition of change would be impossible for lack of presentative material. The thought of succession in time must be based on the direct experience of time-transience, as the thought of red colour is based on the corresponding sensation. As the perception or idea of colour-quality is impossible to the blind, so the perception or idea of change would be impossible to a being without the change-sentience." [1]

The immediate experience of transience is, as such, confined to the moment in which it is being felt. But the apprehension of an event as an object of thought or perception transcends this limit. It necessarily involves the mental reference to a past and to a future which, just

[1] My *Analytical Psychology*, vol. i., p. 160.

because they are past and future, cannot be immediately experienced at the moment, and the present is apprehended only as related to this before and after—as being the transition from one to the other.

§ 3. **Present, Past, and Future.**—What we apprehend as past or future is always determined for our thought as future or past relatively to a present. How is the present itself determined? The only possible answer is that it is determined by some character of immediate experience; and the character of immediate experience which fulfils this function is simply its immediacy. The present is fixed inasmuch as it is the moment of actually felt pleasures and pains, desires and emotions, of actually sensed sensations and of images actually imaged. Whatever is not our actual experience at the moment or not apprehended as being simultaneous with this is referred to the past or future.

This statement, however, requires qualification. It applies only to the present strictly understood as a momentary transition between past and future, a "knife-edge," as Professor James calls it. But what we usually call the present time includes more than this; it includes more or less of the immediate past, and also perhaps more or less of the immediately anticipated future. The reason is that our power of definitely discriminating the parts of duration is limited, and that even when we could discriminate we are not interested in doing so. Hence we do not single out and, so to speak, divide the momentary present as a separately distinguishable object from all that precedes and follows. Thus when we speak of the present we usually refer to what has been called the *specious* present. "In short, the practically cognised present is no knife-edge, but a saddle-back with a certain breadth of its own, and from which we look in two directions into time.

The unit of composition of our perception of time is a *duration* with a bow and a stern, as it were a rearward- and a forward-looking end."[1] This specious present includes more or less of the recent past according to variable conditions. It is perhaps smallest in the experiments, previously referred to, in which the subject is called on to estimate very brief intervals. On the perceptual level, it is longer when conation is obstructed or delayed, and shorter when conation proceeds successfully and easily towards the attainment of its end. The present is long to the hungry child or the hungry dog compelled to wait for its food; whereas one present rapidly succeeds another when the child or the dog is enjoying its play.

Distinction between past, present, and future can be apprehended only in a rudimentary way at the perceptual level. But there is, even at this level, what we may call a "not yet" consciousness and a "no more" consciousness. The "not yet" consciousness is contained in the prospective attitude of attention—in the pre-adaptation for what is to come which it involves. This "not yet" consciousness is emphasised when conation is delayed or obstructed, as when the dog is kept waiting for its bone. In this experience not only is the present lengthened, but the contrast between present and future is heightened. The "no more" consciousness emerges most distinctly when conation is abruptly disappointed or frustrated. The dog in the fable which lets go its actual bone in order to seize the reflected bone in the water, would have this experience in a marked manner.

With the advent of ideal representation the "no more" and the "not yet" experiences become much more definite. This must be the case even when ideas occur only as

[1] James, *Principles*, vol. i., p. 609.

supplements of perceptual process, and not as components of ideational trains. The hungry child seeing preparations for food, may call up a mental picture of itself eating the food. The ideally represented satisfaction stands in sharp contrast with its present impatient hunger. In this case the "not yet" consciousness assumes a very definite form. Sully, who gives this example, illustrates the corresponding "no more" consciousness in the following manner. "A child is watching some interesting object, say the play of the sunbeam on the wall of his nursery. Suddenly the sun is obscured by a cloud and the marvel of the dancing light vanishes. In place of the golden brilliance there now stands the dull commonplace wallpaper. . . . The [ideal] image persists, and attracts the attention by reason of its interestingness. At the same time there is the actual present, the sight of the sunless wall. Here, then, both actual experience of the present and represented experience which is not now, occur simultaneously, and so supply the most favourable conditions for the development of a consciousness of their difference or contrast."[1]

In general, temporal perception is bound up with the process of attention. The primary experience of "pastness" is involved in the cumulative effect of attention on its own process. The primary experience of "futureness," if we may allow the expression, is involved in the essentially prospective nature of attention. The present is characterised by the actual sensations which serve to guide and determine attention at the moment.

§ 4. **Perception of Lapse of Time.**—By perception of lapse of time I mean the perception of a state or process at its termination as having had more or less duration. On this point experiments yield interesting results. Two

[1] *The Human Mind*, vol. i., pp. 320-321.

methods are mainly used. Either "a time interval is presented by the experimenter," and the subject has to repeat this interval as correctly as possible; or "two intervals are presented to the subject, who is asked to determine whether one is longer or shorter than or equal to the other." Each presented interval is bounded by suitable stimuli, *e.g.* electric sparks or momentary sounds. "By whatever method we proceed, one result . . . seems to stand out very clearly. Short intervals tend to be over-estimated, and long intervals to be under-estimated. Between these there is an indifference interval lying between 700 and 800 thousandths of a second. Intervals shorter than this are over-estimated, those longer are under-estimated." Another general result is that "filled" intervals appear longer than empty intervals. "When two sound stimuli limit a given interval, and when this interval is compared with an equal interval which instead of being merely limited by is also occupied by sounds, the 'filled' interval appears longer than the empty interval, the error of estimation increasing up to a certain point with the number of sounds filling the interval."[1]

The most essential factor conditioning this immediate awareness of varying degrees of duration is probably to be found in the process of attention with its accompaniments and results. Where and so far as there is continuity of attention successive experiences are modified by the cumulative effect of retentiveness. This cumulative effect varies in its nature with the amount of time which the process has taken. In this way we can explain why an animal or a human being in preparing for action should be able to wait for the right moment, having no means of determining the right moment except lapse of time. What measures

[1] Myers, *Experimental Psychology*, pp. 297-299.

the lapse of time is the cumulative effect of the process of attending. When we are listening to a sound, our experience is different at the end of one minute from what it is at the end of two minutes, although the sound itself may not have altered in quality. This experience is unique in kind, and it certainly does not consist in having the parts of the sound-sensation, as they successively occur, spread out before us in a sort of duration-line or duration-block.

The same explanation applies to what is called *empty* time. In music, the several notes are separated by temporal intervals. To keep time is to measure these intervals correctly. But it is difficult to say by what means we can measure them, except by the process of expectant attention itself. Certainly it is by no ideal reproduction of a series of events. Of course, empty time is only relatively empty; what is absent from it is the special kind of experience which marks its beginning and end. There are always other experiences going on, especially of a motor and organic kind.

The immediate estimate of lapse of time is most accurate for small intervals.[1] It appears to become progressively less precise as the intervals become larger. If we go for a walk and ask ourselves at any moment how long we have been walking, we can say immediately without any explicit process of calculation that we have been about half-an-hour or about an hour. The limits of error are indeed very wide, but undoubtedly there seems to be *some* power of estimating lapse of time, even for these comparatively long periods. It is not quite a fair test to try this experiment without previous practice; a man may be able to estimate

[1] Many experiments have been made to determine more precisely the conditions on which it depends: but the results obtained are so ambiguous and conflicting, that I have not thought it advisable to trouble the student with them.

lapse of time with a fair amount of accuracy, and yet not have established an accurate relation between his subjective estimate and time as measured by the clock. With practice it is found that a person can tell with a tolerable approach to accuracy and without express calculation when an hour, or two hours, or half-an-hour has elapsed.

The part played by attention in determining this immediate estimate is illustrated by the fact that conditions affecting attention affect it also. When we are bored by monotony, or when we are distracted by a too great variety and rapidity of experiences, the duration of time is so to speak magnified. We say that it "passes very slowly." When attention is very intensely and disagreeably aroused, as in moments of acute danger, minutes may appear as hours. On the other hand, when attention passes easily from object to object, and is agreeably absorbed by each in turn, time passes rapidly. After an entertaining conversation, we may be astonished to find that the hands of the clock have travelled over so much space. This contrast only holds good for the immediate estimate of lapse of time due to the cumulative effect of past process. When we ideally recall a period of time, and estimate it by the number and variety of the events which have taken place in it, the period which has been agreeably spent is apt to appear relatively longer, and the period in which we have been bored, shorter. In ideal retrospect, periods which appeared interminable while they were passing shrink as it were; whereas periods that seemed on their actual occurrence to pass rapidly are correspondingly expanded when we review them in the form of a train of ideas.

BOOK IV.

Ideational and Conceptual Process.

CHAPTER I.

Ideas and Images.

§ 1. **Introductory.**—We now pass from perceptual to ideational process—from those trains of mental activity which are prompted and guided by external impressions and directly worked out in bodily movement to those which proceed independently of external stimulation and are worked out "in the head." Up to this point we have taken into account free ideas only in so far as they supplement processes which are in their essential character perceptual: we have now to consider processes which reach their end through free ideas succeeding each other in a series independently of actual perception. But definitely distinguishable ideas are, in general, connected with correspondingly distinct images, just as percepts are connected with actual sensations. Hence, before expounding the distinctive nature and function of this higher mode of mental activity, it is necessary to examine with some care the characteristic features of a mental image. In what respects does an object as merely imaged differ from the same object as actually perceived?

It should be clearly understood that those visual experiences which are called "after-images" both positive and negative are in reality "after-sensations." They are due to the continued excitement of the organ of sense after the external stimulus has ceased to operate, and cannot therefore be regarded as images. They are easily distinguishable from what has been called the primary memory-image. This is the peculiarly vivid and definite ideal representation of an object which we can maintain or recall by a suitable effort of attention immediately after perceiving it. The persistence of the so-called after-image does not depend on an effort of attention, but on the abiding effect of the external stimulus. It passes, for the most part, very rapidly from a positive to a negative phase and undergoes other modifications which do not affect the primary memory-image. There is also another conspicuous and important distinction: whatever may have been the spatial arrangement of the perceived objects, the corresponding "after-images" are spread out in a flat expanse; but the solidity and perspective of objects as actually seen reappear in the primary memory-image and in ideal images generally.

§ 2. **Distinction and Relation of Image and Idea.**—An idea can no more exist without an image than perception can exist without sensation. But the image is no more identical with the idea than sensation is identical with perception. The image is only one constituent of the idea; the other and more important constituent is the meaning which the image conveys. If I think about the Duke of Wellington, the image present to my consciousness may be only the shadowy outline of an aquiline nose. But this of course is not my idea of the Duke of Wellington. My idea depends on the cumulative result of many complex mental processes, such as the reading of Napier's *Peninsular*

War, etc. If I had been thinking of someone else with an aquiline nose, my mental attitude would have been very different, though I might have had the same image. The same mental image may thus have very different meanings according to context and circumstances. The meaning varies with the train of thought in which the image occurs.

There are some people, especially those who are much occupied with abstract thinking, who are inclined to deny that they have any mental imagery at all. They are almost or quite unable to visualise objects, and their general power of mentally reviving auditory and tactile experiences may also be rudimentary. The images which with them mark the successive steps in a train of ideas are mainly or wholly verbal. What they mentally reinstate in the way of an image is the motor process of articulation, or the sound of spoken words, or both. The words and their meaning are all that are present to consciousness in such cases. Images resembling features or concomitants of the object thought about are absent. But it is inaccurate to say that such persons think without images; for the verbal image is just as much an image in the psychological sense as a visual picture of the object is.

It should be noted however that the verbal image is specially adapted for conveying a kind of meaning which the visual picture or other revivals, imitative of the sensible appearance of the objects thought of, can only convey very imperfectly. All higher modes of *conceptual* thinking are possible only by means of words. To conceive is to think of the general or universal in contradistinction from the particulars which it embraces and connects. If I think of life, for instance, I think of a general kind of process manifested in an indefinite diversity of special ways. The word *life* enables me to fix attention on the common form

of process in contradistinction to its manifold modes of manifestation. A mental picture imitative of the object is less adapted to fulfil this function than the word *life*. Certainly a mind which depended merely on such pictures or similar images could never have formed the conception of life in general for the first time. An imitative image is adapted to represent some very special and obvious manifestation of life, rather than life in general in contradistinction from its particular phenomena.

Conceptual process may be regarded as a higher development of ideational process. As we shall see later on, the transition is a gradual one, and the germs of conception are present even in rudimentary trains of ideas. What concerns us here is that even the highest developments of conception still involve imagery, though the imagery may be and often is purely verbal, or of the nature of mathematical symbols. In the present chapter we have to deal with the nature of mental imagery in general as distinguished from actual sensations, or, as we may also call them, impressions.

§ 3. **Imageless Thought.**—The object of perception is never merely sensation; it is always sensation as meaning something more than its own immediate existence at the moment in which it is being experienced. This meaning is partly original and partly acquired. The like holds good for images. With one important reservation, the original meaning of an impression belongs also to its revival in the image. The reservation is that the *present* existence of external objects is ultimately and directly determined for thought only by actual sensation. Acquired meaning in the case both of impressions and images is the result of dispositions and associations formed and organised by previous processes of continuous attention.

This raises an important question. Why should not

these pre-formed dispositions come into operation without the revival of any distinguishable image and yet give rise to at least vague apprehension of meaning? Such awareness of meaning need not be supposed to consist in pure thought divorced from immediate experience; for the excitement of mental dispositions is undoubtedly sometimes accompanied by vague modifications of experience, peculiar ways of feeling, which do not take shape as images; and it is at least a plausible hypothesis that this is always the case. There is no reason therefore why imageless thoughts should not occur. As a matter of fact, it would seem that they do occur. I shall not here investigate them generally; but it is important to point out that they enter into the constitution of ordinary trains of ideas. Their function is to fill gaps in which relevant images are absent. When I am occupied with a topic I may find that the onward flow of thought is relatively easy and free: verbal and other images emerge in close succession; but there are occasions when I am arrested by a difficulty in making my thought articulate, in formulating it definitely. I may still continue to be intensely occupied with the whole topic and with a certain phase of it. The system of dispositions connected with it may continue in a state of excitement and my immediate experience as a whole may have a peculiar colouring, so to speak; and yet my thought may fail to find rallying points in any definitely discernible images.

These imageless transitions may last for a longer or shorter time. Probably they play a much greater part in the mental life of some persons than in that of others. They may frequently occur so transiently as to escape detection even when we are prepared to look for them. Hence, Professor James may well be right in maintaining that such states, as he calls them, are constantly present as links between imaged ideas. The stream of conscious-

ness on this view is "like a bird's life"; it is "made of alternations of flights and perches. . . . The resting-places are usually occupied by sensorial imaginations of some sort . . .; the places of flight are filled with thoughts of relations, that for the most part obtain between the matters contemplated in the periods of comparative rest. Let us call the resting-places the 'substantive parts' and the places of flight the 'transitive parts' of the stream of thought."[1] It should, however, be noted that the occurrence of imageless thought is not limited to such transitive states. It sometimes yields a comprehensive view of the total result reached by successive steps. "When we have listened to a poem recited," or "to a melody sung," we may forget the words and the tones "while yet all that was in them lives on in an abiding mood of our soul. After the definite outlines" of a landscape "have long disappeared from memory" we may still preserve an indelible total impression. In such cases, "myriads of details are lost, as such, becoming merged and fused in a whole, which we but reluctantly again analyse into its constituents, in order to communicate it to others."[2]

§ 4. **Likeness of Impression and Image.**—The image more or less resembles the impressions which it reproduces. But the reproduction is easily distinguishable from the original; there must therefore be an important difference or differences. The points of agreement are, at least in part, easy to assign. The qualities of sensation, such as colour, sound, etc., in all their varieties enter into the composition both of the perceptual presentation and of the image, and these qualities can only appear in an image

[1] James, *Principles*, vol. i., p. 243.

[2] Lotze, *Microcosms*, Bk. v., ch. iii., translated by Miss Jones. Lotze, however, has in view "the possibility of not only imageless thought, but of purely 'supersensible intuition.'"

because they have previously appeared in an impressional experience. The associations of the impression, its acquired meaning, and its local and temporal order reappear in the image. The reproduction varies greatly in degree of accuracy and completeness. Here individual differences are very conspicuous. Some can scarcely recall colours at all; others can do so with great vividness and accuracy. A person who almost entirely lacks the power to image colours may be capable of reproducing sounds with precision and distinctness. Some men seem quite incapable of reproducing odours; others can reproduce odours more vividly than any other sensible qualities.

These differences have an important influence on the general character of trains of ideas in different individuals. There are some who work mainly with visual imagery, others with auditory, and others, again, with revivals of motor experiences. Between these extreme types there are of course manifold intermediate gradations.

§ 5. **Characteristic Differences of Impression and Image.**—(*a*) *Fragmentariness of Image.* Our actual sense-experience at any moment forms a continuous totality. Particular impressions of touch or temperature form an unbroken unity with the mass of impressional experiences due to the constant excitation of the sensitive surface of the skin over the whole body. The impact of sound waves not only produces auditory sensations, but also tactual sensations due to vibrations set up in the external ear and in other parts of the organism. These tactual experiences on the one hand form part of the general mass of cutaneous sensation, and on the other they unite with the proper sensations of sound so intimately that it needs an effort of analysis to distinguish them. Similarly taste-sensations are intermingled with touch sensations of the tongue and

palate, and through these are continuous with cutaneous impression in general.

As regards sight, each particular visual impression is part of the total experience due to stimulation of the whole retina, and the entire mass of visual sensation is bound up with tactual and muscular experiences due to position and movement of the eye-lids and of the eye-ball in its socket. All joint, tendon and muscle sensations enter into the general "consentience" as we may call it. Finally, all the special sensations of touch, sight, sound, taste, smell, tendon, joint and muscle are intimately united with the organic sensibility and its varying modifications.

Now in the mental image there is no reinstatement of this "consentience." The sensory elements of the image are detached from the total mass of impressional experience of which they would form part, if they occurred as actual sensations. If we mentally image a sound, the imaged sound is not part of one continuous whole with the totality of cutaneous, motor, organic, and other sensations occurring at the moment. Whatever sensations are being produced at the time by the impact of sound-waves on the ear enter into the general consentience; but the merely represented sound is outside the impressional context and remains relatively isolated. Similarly a visual image, however full and distinct it may be as a purely visual experience, is discontinuous with the total sentience. Only experiences due to actual stimulation of the retina or some equivalent condition enter into this. In general we may affirm that all mental imagery as compared with actual sensation has a more or less fragmentary character. The sensory elements revived in the image are cut off from their sensational context and appear in detachment. This is one great distinction, perhaps the most important, between image and percept.

(*b*) *Intensity.* Hume is perfectly right in affirming that percepts differ from images "in the force or liveliness with which they strike upon the mind." But the statement is ambiguous.

We must examine with great care the nature of this force and liveliness, which according to Hume and others is distinctive of sensations.

We cannot affirm that a sound or a colour as mentally revived is always louder or brighter than the corresponding sensation. On the contrary, it would seem that variations in the *degree* of a sensible quality are reproducible in much the same way as variations in *kind*. I may mentally recall the brightness of an electric light, and I may then actually look at the comparatively dim flame of a candle. On comparing the image with the percept, I may recognise that the electric light as mentally revived has a higher degree of brightness than the candle-flame as actually seen. It is true that the power of representing gradations of sensible quality varies in different persons, just as the power of representing the qualities themselves varies. But good visualisers seem to possess it in a very high degree. A person so endowed, in giving an account of his mental picture of the morning breakfast-table, says: "I have more power to recall colour than any other one thing; if, for example, I were to recall a plate decorated with flowers I could reproduce in a drawing the exact tone, etc. The colour of anything that was on the table is perfectly vivid."[1]

Are we then to reject the distinction between images and percepts as respectively "faint" and "vivid"? This is a possible course. There are other differences which may be regarded as ordinarily sufficient to prevent con-

[1] James, *Principles of Psychology*, Vol. II., p. 56.

fusion between them. But we ought to hesitate before discarding a distinction generally accepted both by psychology and common sense. On the other hand, if we accept it, we must mean by "vividness" something different from intensive gradations which may be equally present in impression and image. What is this vividness? The answer seems to be contained in Hume's words. According to him the distinctive characteristic of percepts as compared with images is the force and liveliness with which they strike the mind. This "striking the mind" is the essential point. At bottom the difference is a difference of kind, not merely of degree. Images do not strike the mind in the same way as actual sensations.

To bring out the nature of the difference it will be most convenient to consider first cases in which it is conspicuous. It is most conspicuous where the sensation breaks in upon consciousness in a violent manner, so as to interrupt and disturb the flow of mental activity. A dazzling flash of lightning or the piercing scream of a steam-whistle may serve as illustrations. The shriek of the steam-whistle invades consciousness in a violently disturbing way. There is a sense in which the degree of loudness of the sound might perhaps be mentally reproduced with tolerable accuracy by a person possessed of exceptional powers in this direction. But the mode of occurrence in consciousness would be different. The mentally revived sound would not "strike the mind" like the sound as actually heard. No mere image ever does strike the mind in this manner.

In such experiences as that of the steam-whistle the primary impression is by no means the only factor at work. The whole organism receives a shock giving rise to a mass of organic and motor sensations. In ideal revival these concomitant sensations fail to be recalled except in a very imperfect way. It may be suggested that it is

their presence in the actual sense-experience which gives to this experience its aggressive character. Now it seems evident that they cannot give an aggressive character to the experience unless they possess this character themselves, and as a matter of fact they are highly intrusive and obtrusive. But if organic sensations can "strike the mind" in this way, there is no reason why other sensations should not do so too. The ultimate appeal must be to introspection. This shows in the case of the steam-whistle that the sound itself is aggressive in the same way as the organic sensations which accompany it. The organic sensations follow the beginning of the sound after the lapse of about a second, but the sound itself is aggressive from the outset.

The steam-whistle is an extreme case, involving violent shock and disturbance. But there are abundant instances in which sensations strike the mind without overwhelming it in this painful manner. The chimes of a bell heard as we are passing in front of a church break in upon consciousness with notable force and liveliness. But they need not have a disturbing effect, and they need not be accompanied by conspicuous organic sensations. None the less they have an impressiveness or aggressiveness analogous to that of the steam-whistle. The same holds true generally of sensations produced by a stimulus which is stronger than we are accustomed to. But there is a certain normal level of intensity of stimulus at which and below which we do not naturally notice the aggressive character of the sensation, unless it occurs suddenly and finds us unprepared. At these lower intensities the aggressiveness of the sensation does not under ordinary conditions catch our attention: but it would be wrong to conclude that it has therefore ceased to exist. We do not usually take note of what is familiar to us, but only

of what is relatively unfamiliar. It is therefore natural that the characteristic of sense-experience which is expressed by such metaphors as "striking" the mind or "laying hold" on the mind should normally be noticed only when it is present in an unusual degree of intensity.

Its presence even in these lower phases of intensity may be detected if we pass from the comparison of impressions with impressions to the comparison of impressions with images. If we look at a sheet of white paper, and then, closing our eyes, call up a mental picture of the paper, its brightness as actually seen may be revived with approximate accuracy in the image. But if we again open our eyes, and pass from the mental picture to the actual percept, we may note in the moment of transition a difference which can only be described by saying that the image does not strike the mind as the actual percept does. We may vary the experiment by first calling up mentally the image of an electric light, and then looking at a dimmer object, such as a candle-flame. The imaged brightness of the electric light is greater than that of the candle-flame; but the actual sensation of brightness which we have in looking at the candle-flame enters and persists in consciousness in a different manner from the mental picture of the electric light. It strikes the mind with some degree of force and liveliness; whereas the mental image does not strike the mind in the same way.

Our conclusion is that at bottom the distinction between image and percept, as respectively faint and vivid states, is based on a difference of kind. The percept has an aggressiveness which does not belong to the image. It strikes the mind with varying degrees of force or liveliness according to the varying intensity of the stimulus. This degree of force or liveliness is part of what we ordinarily mean by the intensity of a sensation. But this constituent of

the intensity of sensations is absent in mental imagery. Since it is distinctive of impressions, we may call it *impressional intensity.* Impressional intensity may depend on suddenness. A slight sound, when we are totally unprepared for it, may enter consciousness in a violent manner; but in the main impressional intensity increases or decreases concomitantly with the intensity of the stimulus. The smaller it is the less effectively will it serve as a mark distinguishing percept from image. Hence when it is very slight it may be practically inoperative. Thus we may fail to distinguish between a very slight sound as actually heard, and the mental representation of it. The possibility of this has been shown experimentally; but it does not, as has been supposed, constitute a valid argument for regarding the distinction between image and percept as merely one of degree.

(*c*) *Distinctness.* Images as compared with percepts have for the most part a sketchy or schematic character. Part of the filling in of the actual sense-experience fails to reappear in its reproduction, which is therefore blurred and hazy.

This does not apply without exception to all mental imagery. Most persons, if not all, can reproduce in a precise and delicately differentiated manner certain kinds of experience. The internal language by which trains of thought are habitually carried on in human beings is often a very precise reinstatement of signs used in the interchange of ideas between different persons. In many cases words as mentally reproduced are fairly exact counterparts of words as actually spoken. Both sound and motor articulation are revived in a precise and clear-cut way. The image lacks impressional intensity; but its qualitative content is indistinguishable from that of the percept. In some persons the motor activity of articulation is very pre-

cisely revived, but the auditory element is absent or almost absent. Others mentally envisage printed or written characters either in addition to, or instead of, internal speech.

Even those persons who can reproduce articulate sounds with maximum distinctness may be unable to recall inarticulate noises except in the vaguest manner. When they make the attempt, they tend to substitute some imitation by the human voice for the noises themselves.

The schematic character of ideal representation is best exemplified in the mental reproduction of the appearance of material things as they are presented to sight and touch, and explored by movements of the eye and hand. In most persons this reproduction is predominantly visual, though some depend mainly on motor and tactual revivals. We shall here only consider visual imagery. This often includes motor revival: for, with many persons, the "inward eye" follows the contours of objects and scans their parts successively much as the bodily eye does.

It is well known that there are very great differences between the visualising powers of different individuals. Some few seem to be capable of calling up mental pictures of what they have seen, possessing a vividness, distinctness, and wealth of detail little short of actual vision. But the accounts which these people give of themselves must certainly be accepted in many instances *cum grano salis.* They are usually untrained in introspection, and they probably do not express themselves with rigorous precision. In any case we must make a point of distinguishing between what a man is capable of in the way of visualising when the occasion requires him to do his best and the imagery which enters into his ordinary trains of thought. We shall see at a later stage that the habitual recall of all the concrete detail of actual perception would

in ordinary thinking, such as takes place by means of words, be not only a superfluity, but an encumbrance, destroying efficiency. A man who can call up mental pictures equal in distinctness to the reality is no more likely to do so habitually, than a man who can take very long leaps is likely to substitute these for ordinary walking. Setting aside certain exceptional cases as not yet sufficiently investigated, we may affirm that ordinary visual imagery is more or less sketchy and blurred in comparison with actual vision. In some men, including many of the best introspective psychologists, such as Fechner, it is so very blurred and sketchy that it could scarcely become more so without ceasing to exist altogether.[1] The mental pictures of these persons can scarcely be called pictures at all. They are rather the indescribably attenuated ghosts of pictures. They are, to use Fechner's language, "airy, unsubstantial and vaporous." Persons possessing a much higher visualising power than Fechner will readily recognise the aptness of these terms as applied to the greater part of their own visual imagery.

Very poor visualisers often find the greatest difficulty in indicating what it is that they actually see with the mental eye. Thus one of James's pupils, asked to call up a picture of his breakfast-table, replies: "There is nothing definite about it. Everything is vague. I cannot say *what* I see. I could not possibly count the chairs, but I happen to know that there are ten. I see nothing in detail. The chief thing is a general impression that I cannot tell exactly what I do see."[2] This is a somewhat extreme case.

[1] There are a few exceptional cases, in which the power of visualising appears to be almost completely absent. Mr. Welton, of Leeds University, assures me that he does not possess even the rudiments of visualising faculty.

[2] *Op. cit.*, vol. ii., p. 54.

But it brings out the point which most requires to be emphasised in this connection. The indistinctness of mental imagery is to a large extent of a quite peculiar character. It is different in *kind* from the indistinctness of percepts such as may be due to dimness of light, distance, and the like. It is also different in kind from the indistinctness of positive and negative after-sensations in the various phases through which they pass. An image is sketchy and schematic, because it contains only an extract from the content of sense-perception. But it is a surprise to most people who subject these images to introspective scrutiny when they discover how the extract is often made. It becomes quite intelligible to them that Alice in Wonderland could see the grin without the cat. This applies not only to complex objects, but also in the experience of some persons to apparently simple sensible qualities such as colours and sounds. I attempt to recall a certain definite shade of red and I succeed. On comparing the imaged red with the perceived, I am able to identify the two as the same colour. But they are the same with a difference which does not wholly consist in absence of impressional intensity. There is a "filling in" in the percept which is non-existent in the idea. What this "filling in" may be I cannot say. All that I am confident about is that it is conspicuously present in the percept and conspicuously absent in the image.[1]

The comparative indistinctness of images is traceable to various causes. It is partly due to what Dr. Ward has called "obliviscence." Some parts of the impressional experience have disappeared from the image, simply because of a deficiency in our power to retain or at least

[1] I am also confident that the "filling in" does not wholly consist in accompanying motor and organic sensations.

reproduce them. The vagueness of the mental image is also increased by what Dr. Ward calls "reduplication." It is the product, not of a single perception, but of a plurality of perceptions which agree only in certain points, and differ in others. Only the points of agreement are recalled in a fixed and definite manner. The divergent details by their very divergence obstruct the process of reproduction. Hence, so far as they are concerned, the image is vague and fluctuating. "One who had seen the queen but once would scarcely be likely to think of her without finding the attendant circumstances recur as well; this could not happen after seeing her in a hundred different scenes."[1]

But there is a still more important reason for the comparative indefiniteness of ideal revival. It would be not only useless, but disadvantageous, to recall all the details of impressional experience. A connected train of ideas is in its character conative. It takes place in the service of some practical or theoretical interest. Only so much need be revived as may be required by the dominant interest of the moment; all else being irrelevant would be a mere encumbrance, hindering and embarrassing the course of mental activity. If I wish to recall what I did yesterday, in order to find out how far I have fallen short of the moral ideal, or for any other practical reason, a few minutes will probably suffice for retrospect. But how is it that I can recall in a few minutes experiences which occupied twelve hours? Only by omission. We simply make an outline sketch, in which the salient characters of things and events and actions appear, without their individualising details. Mere forgetfulness in part helps to make this possible;

[1] Ward, article "Psychology," *Encyclopaedia Britannica*, ninth edition, xx., p. 62.

but there is much also which I do not forget, and yet do not recall. I pass it over simply because it would not help me, being irrelevant to my guiding interest. "If I picture myself as eating my breakfast at the beginning of the day, it is enough to have a generic image of the breakfast-table and the succession of particular incidents which took up the half-hour spent in eating. Hence it is possible for me to recall the whole event of taking breakfast, which occupied half an hour, in the fraction of a minute, and then to pass on to something else."[1] In general, mental imagery is more detailed and vivid in persons whose interests are concrete rather than abstract. The savage, the uneducated person, and the poet or artist have usually far more power at least of mental visualisation and often of other modes of imagery than the mathematician or the philosopher. As we noted above, persons habituated to abstract thinking have often little or no definite imagery, except reproductions of words.

(*d*) *Relation to Subjective Activity.* In actual sensation we are relatively passive and receptive, because impressions are determined by a factor which is not psychical at all—the stimulus. What the stimulus does for us in perception, we have to do for ourselves in the case of free ideas. Images are attended to only so far and so long as they connect themselves with the general direction of mental activity at the moment or arouse a new current of activity by bringing into play pre-existing conative tendencies. Impressions on the other hand tend by their impressional intensity to compel attention. If they are sufficiently intense they may forcibly divert attention from the most absorbing train of thought.

Impressions, so long as the stimulus persists on which

[1] *Analytic Psychology*, vol. ii., p. 185.

they depend, display a steadiness which is absent in the case of images. Images are maintained before consciousness purely by an effort of attention; when we are attending to a percept, impressional intensity due to the stimulus co-operates with our subjective activity, steadfastly sustaining it. Now attention is never perfectly fixed and continuous. It flags at intervals and constantly tends to pass from one point to another; it is probably subject to a regular rhythm of remission and concentration. Hence the peculiar unsteadiness of images even when we deliberately attempt to arrest and detain them. As Dr. Ward says, the image, in spite of our efforts to fix it, "varies continually in clearness and completeness, reminding one of nothing so much as of the illuminated devices made of gas jets common at fêtes, when the wind sweeps across them. . . . There is not this perpetual flow and flicker in what we perceive."[1] Dr. Ward perhaps goes too far in attributing this "flow and flicker" to all mental imagery. The statistical evidence seems to show that some exceptionally gifted persons can maintain a visual image before their mental view without these fluctuations. But even in these cases the detention of the image costs a kind and degree of mental exertion which is not required in attending to percepts.

The same contrast manifests itself in another way when we compare impressional change and transition with the sequence of images. Images, as vehicles of ideas, usually follow each other in accordance with purely psychological conditions; their sequence is determined by preformed associations together with the general trend of mental activity at the moment. The flow of images thus depends on the continuous self-development of the attention-

[1] Article "Psychology," p. 569.

process. Changes in impressions, on the contrary, are only partially initiated by the changing direction of attention. They are determined to a very large extent by alterations in the nature of the stimuli affecting the organs of sense. So far as this is the case they bear the character, not of a continuous development of conscious process, but of something which *happens* in consciousness. This character is most conspicuous when external changes suddenly introduce experiences for which the mind is unprepared, as when the chair we are sitting on unexpectedly gives way beneath us. But even when we are awaiting an event and are prepared to act appropriately when it comes, there is still a certain discontinuity or abruptness in the mode of its occurrence in consciousness as compared with the sequence of ideas in a train of thought. It is not a continuation of our own mental activity; it is something which happens to us, something which strikes upon the mind from without.

(*e*) *Relation to Motor Activity.* Inasmuch as percepts depend on external stimulation proceeding from surrounding things, they must vary with the spatial relations of the organism and its parts to environing conditions. Hence our perceptions vary with our movements. We can carry our images about with us; but if we turn our head away or close our eyes we can no longer see what we saw before. In particular the sensations we receive vary with the adaptation of our sense-organs. For most distinct vision we bring the eye into such a position that the rays from the object fall on the yellow spot; we accommodate the lens so that they form a distinct image on the retina, and so forth. The presence of these motor adjustments forms an important distinction between actual vision and visual imagery. The same holds good *mutatis mutandis* of the other senses.

It is true that there is also an adjustment to images, and that this adjustment consists in great part of a revival of the motor experiences which enter into actual perception. But the revival is easily distinguishable from actual movement. There is a difference of general attitude. In merely imaging "the attention feels as if drawn backward, towards the brain." The motor revival exists side by side with the sensations due to the actual state of the organism and its parts. We may be scanning a mental picture, and this may involve some revival of the motor processes involved in actual vision. But at the same time we abstain from the corresponding active movements of the eye. The bodily eye may even be closed. Thus the motor revival is the more easily distinguished from actual movement because the actual sensations of position and movement which we receive from the eye are incompatible with the movements which are ideally reproduced. The reproduced movements appear therefore to occupy an inner circle. Extruded from the periphery they seem to take place within the head.

§ 6. Relative Independence of Percept and Image.— Gazing at the blue sky, we may, as Dr. Ward observes, mentally picture a portion of it as red instead of blue. Now it is very important to note that most people, while they are imaging the sky as red, do not cease to see it as blue. The red does not get between them and the sky so as to hide its blueness. Similarly, in calling up with closed eyes a visual image, most persons find that this image does not form part of the grey field which is due to the retina's own light. It may sometimes appear to be merging itself in the grey field. But when this happens it is in reality disappearing altogether as an image and becoming an impression. The more distinctly it has the character of an image, the more disconnected and inde-

pendent it appears relatively to the sensations which have their source in the state of the retina.

The case is similar with other senses. I can imagine how the fingers which are now holding my pen would feel if they were dipped in warm water. But the mental image does not annul actual sensation. Similarly, I can clearly distinguish a mentally articulated word, however faint it may be, though my ears are simultaneously assailed by a deafening din. I can also articulate a word mentally when my organs of speech are motionless or engaged in uttering other sounds.

Facts of this kind show that percepts and images possess a relative independence. This can be accounted for if we suppose that the nervous tracts excited in perceptual process are not wholly coincident with those excited in connexion with imagery.

This view is borne out by pathological cases. There are cases in which the power of recalling images—visual, tactual and auditory—was apparently non-existent, without loss of the corresponding sensations.

The question as to the relation of the nervous seats of sensations and percepts on the one hand, and of ideas on the other, is still a vexed one. But the most probable conclusion appears to be that, though they are continuous and more or less overlap, they are by no means necessarily coincident.

In any case it is plain from ordinary experience that the existence of sensations does not imply the possibility of corresponding images. Persons who have little or no power of visual imagery can see actual objects as well as the best visualisers. Similarly, those who have very limited power of mentally reviving sounds may have quite keen auditory perception. Few people, if any, have in a considerable degree the power of calling

up mental images of organic sensations. In animals, well-developed perceptual powers may be combined with little or no capacity for mental imagery.

§ 7. **Hallucinations, Illusions and Dreams.**—To understand the nature of hallucination we must bear in mind what has been said concerning the distinction between sensible appearance and external reality.[1] Normally, we are able correctly to recognise perceived things throughout the variations of their sensible appearance. The variations do not normally lead to gross misapprehension of the nature of things perceived, still less do they cause or strongly prompt to belief in the presence of things in our environment which in reality are not there at all. But extreme cases occur, mainly under pathological conditions, in which this is otherwise. The result is what is called hallucination. A certain impressional experience has in the past acquired associations through which it habitually, vividly, and urgently suggests the presence of a certain kind of external object. When such an object is actually present as a condition of the sensations which suggest its presence, there is correct perception. What appears to be perceived really is perceived. When, in the absence of such an object, sensations of the same kind are produced by other conditions, there is either illusion or hallucination or something intermediate between the two.

In the case of pure illusion the senses are in a normal state and are affected in a normal way by something actually present; but the resulting impressions, either owing to inveterate association or to some other cause, suggest the presence of something of a different nature. This happens, for instance, when a wax figure is taken for

[1] Bk. III., Pt. II., Ch. II., § 3.

a living man, or a dummy book for a real one, or an empty egg-shell for an egg with the usual contents. Similarly, when in a stereoscope two flat drawings appear as a single solid figure, the sensations experienced are produced in a normal way, but their habitual associations suggest an object different from that which is actually present.

In hallucination, on the contrary, the impressional experience is due wholly or in part to an exceptional state of the sense-organs themselves or of their nervous connexions. Thus in *delirium tremens* a man appears to "see rats" or "see snakes" because he has impressions similar to those which he would have if he actually perceived rats or snakes, and because the acquired meaning of these impressions is vividly and irresistibly suggested by habitual association. But in contrast with cases of illusion, the impressions themselves are not due merely to a stimulus affecting the retina in a normal way: they are due instead partly or wholly to an abnormal state of the nervous system induced by alcoholic poisoning. The result is that kind of erroneous perception which is called hallucination.

A perception may be partly an illusion, and partly an hallucination. Thus we may appear to see a man, when what is perceived is really a suit of clothes. The special nature of the sensations experienced may be due partly to the suit of clothes, and partly to an exceptional state of the visual apparatus; so far as the sensations which arise in a normal manner from the external stimulus are wrongly interpreted, there is illusion; so far as other sensations due to an abnormal condition of the retina or nervous system enter into the experience, there is hallucination. It may happen in such a case that no other sensations are present except those which the suit of clothes would normally produce: and that the error lies wholly in

a wrong interpretation. When this is so, the illusion is a pure illusion without any element of hallucination.

It is not necessary that all the ordinary characteristics of impressional experience should be present in hallucinations. Dreams partake of the nature of hallucinations in so far as the dreamer appears to see and hear what does not really exist in the external world. But it sometimes happens that these dream-experiences are indistinct and lack impressional intensity; and in general they are without that dependence on motor activity which marks percepts. Their impressional character is mainly due to their independence of subjective activity—the discontinuity and abruptness of the mode of their emergence into consciousness. We are passive in relation to them in the same way in which we are passive in relation to actual objects present to the senses. Probably the hallucinations produced by suggestion in hypnotised subjects are of a similar kind.

The conditions of hallucination include certain variations in the nature and distribution of the blood-supply within the brain and pathological affection of the brain-substance. The blood may contain poisonous materials, such as alcohol, opium, ether, chloroform, and the like, which have an irritant effect on the nervous system. In sleep, owing to lowered respiration, the blood becomes charged with carbonic acid, which may have an exciting effect on the sensory areas of the brain.

Many hallucinations are the conjoint effect of the peculiar state of the nervous system and of the operation of normal stimuli on the sense-organs. So far as this is so, hallucinations assume in part the character of illusions. This holds to a large extent for dream-experiences. A slight pain in the ribs makes the sleeper dream of a stab from a dagger or of the bite of a dog. Contact with a cold body may give rise to the dream of a corpse. The

excitement of the retina by internal conditions plays in some cases a very important part in constituting dream-pictures. On this subject we may quote the interesting experiences of Professor Ladd. "Almost without exception, when I am able to recall the visual images of my dream and to observe the character of the retinal field quickly enough to compare the two, the schemata of the luminous and coloured retinal phantasms afford the undoubted clue to the origin of the things just seen in my dream-life."[1] By long practice Professor Ladd has acquired the power of dropping gradually into a dreaming sleep and then suddenly awaking with his attention fixed on the comparison of his dream-pictures with the experiences of light and colour due to the internal processes of the retina, which in his case are peculiarly brilliant and varied. "The most elaborate visual dreams may originate in intraorganic retinal excitement. Perhaps a harder problem could not be given to my experiments to solve than the following: How can one be made by such excitement to see a printed page of words clearly spread out before one in a dream? . . . But I have several times verily caught my dreaming automaton in the feat of having just performed this transformation. On waking from a dream, in which I had distinctly seen lines of printed letters forming words and sentences, and had been engaged in reading these lines by sight, I have clearly detected the character of that retinal field which had originated such an extraordinary hallucination. The minute light and dark spots, which the activity of the rods and cones occasions, had arranged themselves in parallel lines extending across the retinal field."[2]

Pure illusions are illusions in which no element of

[1] *Mind*, N.S., vol. i. (1892), p. 301. [2] *Ibid.*, p. 302.

hallucination is present. The impressions made on the senses of the observer may give rise to just the same sensations as they would normally produce, and yet the things and processes apparently perceived may not actually exist or take place. It is mainly this pure illusion, unmixed with hallucination, which is exemplified in the tricks of ventriloquists and conjurers. When a juggler swallows a sword merely in appearance, the sensory impressions made on the eye of a spectator are very much the same as if the juggler had swallowed the sword in actual fact. For this reason, pure illusions may be shared by a great number of persons simultaneously. On the other hand, collective hallucinations, through their existence is guaranteed by the Psychical Research Society, are of rare occurrence, and stand much in need of explanation.

CHAPTER II.

Trains of Ideas.

§ 1. **Two-fold Aspect of Ideational Process.**—Trains of ideas, like trains of perceptual activity, have, in general, a certain unity and continuity of interest. They subserve some end, practical or theoretical. Those transitions in the flow of ideas which show a break in continuity of interest are, in general, transitions from one train to another. It should be noted that the interest which gives unity to a single train may be very slight and evanescent. Thus the train may be no more than a passing thought. It may appear to consist of a single idea; but if it tends to gratify any interest, however evanescent, it may none the less be regarded as a continuous train.

The course of a train of ideas is determined by two distinct groups of conditions. On the one hand it is reproductive, and on the other productive. The material for it must be derived from past experience. But this material is variously shaped and transformed by the total mental condition existing when the ideal revival takes place. Even when we are interested in reviving past events, as such, preserving as far as possible their original nature and order, yet the mode in which they appear to consciousness is determined by the circumstances of the present, and by all that has taken place since their original occurrence. It is for this reason that on their revival they come before consciousness as past events; whereas on

their original occurrence they bore the character of present experiences.

Every train of ideas, then, has both a reproductive and a productive aspect; though the relative dominance of the two aspects may vary indefinitely. We shall first consider the reproductive side of the process, under the head of Association of Ideas; and then the productive, under the head of Ideal Construction.

§ 2. **Association of Ideas.**—For a general account of the nature of Association, we must refer to bk. ii., ch. iii. The basis of all associative connexion is the concurrence of different presentations in the formation of a single cumulative disposition, which tends to be re-excited as a whole whenever any of the experiences recur which have combined to produce it. If we suppose that two presentations, a and b, have been united in this way so as to form the total disposition $\alpha\beta$, the re-occurrence of an experience similar to a will re-excite $\alpha\beta$. If the reproduction takes the form of mere acquirement of meaning or of complication, the result is a modification of a, which we may represent by a_b. But in ideal reproduction something more takes place. The occurrence of a_b is followed by the separate revival of b_a, as a relatively independent step in the successive flow of mental process.

It must be noted that the tendency is to the revival of the total experience ab. Hence, apart from interfering conditions, b will tend to be revived in the same relation to a as that in which it originally occurred. If in the original experience one object has been apprehended as succeeding another, or as situated on the top of another, or as logically dependent on another, the tendency of the ideal revival will be to represent the object in the same relations. It is evident that these objective relations may be indefinitely numerous and diverse in nature. Hence it

is impossible to base on them a classification of the various forms of association of ideas. As Reid remarks: "Every relation of things has a tendency, more or less, to lead the thought, in a thinking mind, from one to the other."[1] It follows that in classifying the forms of association of ideas we have to consider, not the relation of object *a* to object *b*, but rather the relation of the apprehension of *a* to the apprehension of *b*. Ultimately, all depends on continuity of attention: but this continuity may be direct or indirect, giving rise to two forms of association which are commonly called association by *contiguity* and by *similarity*.

§ 3. Different Forms of the Association of Ideas.— (*a*) *Contiguity* (*Continuity of Attention*). The law of Contiguity, as ordinarily understood, may be stated as follows: If *B* has been perceived or thought of together with *A* or immediately after *A*, then, on a future occasion, the perception or idea of *A* will tend to call up the idea of *B*. In other words, the sequence of ideas follows the order in which their objects have been attended to in previous experience. The underlying principle is that mental activity when partially revived tends to repeat itself; it can only repeat itself if its original direction and order are reproduced.

This law, though it is valid, is not sufficiently comprehensive. It covers only a special case of a wider principle. It refers only to temporal continuity instead of continuity of attention in general. It is by no means true that association connects only those objects which occupy attention in immediate succession. This has been shown experimentally. Professor Ebbinghaus found that after learning by heart a series of disconnected syllables, which we may denote by *A*, *B*, *C*, *D*, etc., it cost him relatively a much

[1] *Works*, Hamilton's edition, vol. i., p. 386.

shorter time to learn the same series with regular gaps in it, *e.g.* *A* · · *D* · · *G* · · , etc. Repetition of the series *A*, *B*, *C*, *D* served to establish associative links not only between *A* and *B*, *B* and *C*, *C* and *D*, etc., but also between *A* and *D*, *D* and *G*, *G* and *H*, etc. The same point is more conspicuously illustrated in ordinary experience. In recalling a train of events we usually pass from one salient occurrence to another, leaving out the relatively unimportant details which actually intervened between them. Similarly, in describing an object, I do not mention all the details which I actually observed in the exact order in which I noticed them. On the contrary, I pass from one characteristic and distinctive feature to another, oblivious of much which is not characteristic and distinctive. The dominant interest of the original experience and the dominant interest at the time I recall it determine a selection of items which is by no means tied down by the condition that objects which introduce each other in the train of ideal revival must have been attended to in immediate succession.

The truth is that the most important condition of association is not mere *contiguity* in the strict sense of temporal continuity of attention, but also *continuity of interest*. Where continuous interest pervaded the original process, the stronger this was the more selective is the revival apt to be, links being dropped out which are relatively unimportant to the general trend of mental activity. This is well brought out in the special case in which some process having continuity of interest is carried out with interruptions occurring at intervals. If the interruptions are not themselves of a specially interesting kind, we tend to omit them altogether in recalling the main activity. The gaps, so to speak, close up.

It may be asked why in any case we should remember

the interruptions, even when they are specially interesting. For where there is interruption, there is not continuity, but rather *discontinuity* of interest. The answer is that at the moment at which the interruption takes place there is temporal continuity of attention. The interruption is itself an experience which belongs to both the end of one process and the beginning of the other.

Immediate succession of this sort is not, however, the ultimate condition of association. Ideal revival may and often does proceed by leaps and bounds. But it must be conceded that the immediacy of the succession does count as a very important factor. Other things equal, the direct transition of attention from A to B will be repeated in ideal revival, rather than a transition from A to C which originally took place through the intermediate link B. In proportion as the control of a dominant interest is weak and intermittent, the tendency is to exactly repeat the original order without omissions and inclusive of interruptions. This is well seen in the conversations of feeble-minded persons. Of course the original order will be exactly repeated, where there is an interest in exact repetition, as in learning by heart.

(*b*) *Reproduction of Similars.* It is a fact familiar to all of us that objects remind us of other objects similar to themselves. Ought we, therefore, to recognise resemblance as an independent condition of association distinct from any form of continuity of attention? We may take as a typical example the case of a portrait calling up the idea of its original. If in the past we have already attended to both original and portrait in relation to each other so as to compare them and to become aware of their likeness, the subsequent recall of one by the other is capable of being explained on the principle of continuity of attention. But so far as this explanation applies we

are not really dealing with what is especially distinctive of the recall of similars by similars. This is not dependent on co-presentation in previous experience. The portrait may suggest its original even when it is presented for the first time, so that we cannot have previously perceived or thought of the two in relation to each other. This seems to warrant our treating resemblance as a distinct and independent condition of association.

Before committing ourselves to this conclusion, let us first consider what it would imply. Clearly we must extend it beyond what are ordinarily regarded as cases of recall by resemblance. If we recognise a distinct principle of association by similarity we seem bound to recognise its operation as essentially implied in all revival by association. Take the simple instance in which the sound of one letter of the alphabet, A, reminds us of the sound of the next letter, B. On previous occasions we have had a multitude of sound-sensations A_1, A_2, A_3, etc., closely resembling each other. We have also had other sound-sensations B_1, B_2, B_3, etc., also closely resembling each other. Further, A_1 has been connected in past experience with B_1, A_2 with B_2, and so forth. We have now a new presentation A_n which, as it is now experienced for the first time, cannot have been previously connected with any member B_n of the series B_1, B_2, B_3, . . . How then can A_n revive a B_n in the form of an image? Only, it would seem, in a circuitous way. A_n must re-excite the several dispositions formed by A_1, A_2, A_3, etc., so as to evoke corresponding images; this will then be followed by the re-excitement of the several dispositions due to B_1, B_2, B_3, and by the corresponding images. It is plain that such a theory is hard to reconcile with the facts. When the letter A recalls the letter B we are not normally aware of a multitude of A images, and of another multitude of B images. All that is discernible

is the given presentation A_{n} and the revived presentation B.

This indicates that we are wrong in assuming a plurality of distinct dispositions corresponding to similar presentations. We must rather assume that there is one and the same disposition for like presentations in so far as they are alike—that so far as retentiveness is concerned resemblance, so far as it extends, is virtually identity. But if we proceed on this principle, we cannot regard similarity as an independent condition of association. For association is a connexion of partial dispositions in a complex disposition, so that it cannot exist where there are no distinct dispositions to be connected. When, therefore, we see a portrait, the disposition due to previous experience of the original is already partially re-excited without requiring a further step, depending on association. It is already re-excited in so far as portrait and original really have a common character. The work of association is merely to bring before the mind further characters and relations in which the original differs from the portrait. What is reproduced consists in points of unlikeness, not in points of likeness. But this is possible only because the characteristics in which the original agrees with the portrait have already been attended to in the past in relation to the characteristics in which it differs. Thus the only ultimate condition is some form of continuity of attention.

None the less the revival of similars is distinguished from other modes of reproduction by important peculiarities. It involves what we may name *divergent* or cross recall as distinguished from *serial* recall. In serial recall we attend again to a train of objects *a*, *b*, *c*, *d*, *e*, in the order in which we have previously apprehended them. If now in the course of this process *c* suggest a similar object *y*, *y* need not, and very frequently has not, ever

before been brought before the mind in connexion with *c* or with the original series *a*, *b*, *c*, *d*, of which *c* forms a part. There is thus a cross-transition from one train of ideas to an otherwise disconnected train. I may have seen a portrait before seeing the original, and I may subsequently recall it as belonging to a series of incidents connected with a visit to the house of its owner. It will be remembered in connexion with the room in which it was hung, and what took place in that room, and so forth. But if in the meantime I have met the original, then on seeing or ideally recalling the photograph again, I may be reminded of the original and his history and circumstances. Thus two otherwise disconnected groups of associated ideas will be suddenly brought into relation with each other for the first time.

In this way the revival of similars is a fruitful source of novel combination. It is, as Bain remarks, opposed to routine, leading the mind away from beaten tracks. Another peculiarity of the revival of similars is that the common features on which the revival depends are separately presented twice over, (1) as features of the given object, and (2) as features of that which is reproduced. When a photograph reminds me of its original, the points of likeness which mediate the mental transition are twice presented in different and incompatible contexts. To begin with they are constituent items of the presentation of the photograph, and again they are constituent items of the presentation of the person photographed.

Serial reproduction as well as reproduction of similars presupposes, for the most part, only partial identity of nature of the given object with one apprehended previously. Smoke reminds one of fire because of preformed associations. This is serial reproduction. But the smoke I now see may have features of its own in which

it differs from previous experiences. It may be more voluminous, lighter or darker in colour, and so on. In other words, there need only be similarity, not complete identity. The points of difference do not contribute to bring about the reproduction. The partial identity is alone operative in this. But the specific differences may none the less play a positive part in the process. Though they do not help to bring about reproduction, they modify the nature of what is reproduced. A thin thread of smoke suggests a small fire; a large volume suggests a big fire. Smoke on a moorland and smoke rising from a house in London both suggest fires, but with very important differences. The reproduction is due to their identical character; the difference in what is reproduced is due to their different mental setting.

Now in the reproduction of similars the points of divergence between the reproducing presentation and that which is reproduced play no positive part in determining the reproduction. The partial identity of personal appearance between a man whom I meet casually and the Duke of Wellington calls up in my mind the idea of the Duke. But this idea is not transformed in a special manner by the divergent characters which distinguish the man before me from the victor of Waterloo.

We must, at this point, distinguish between the actual reproduction of similars and the processes which frequently follow on it. When one presentation has called up another similar to it, the mind may proceed to compare them, and it may make the partial identity which is discernible between them the basis for working out a parallelism in other respects by means of further processes. The relation of an apple to the earth reminds Newton, according to the familiar legend, of the relation of the moon to the

earth. But he does not stop here. Fixing attention on the partial identity, he strives to enlarge it by tracing identity in other respects also. This takes place by trains of thought in which the effect of serial association is profoundly modified but not arrested by the difference of the two.

§ 4. **Competition of Divergent Associations.**—The same experience may have, and generally has, a great many connexions in the way of association. The question naturally arises, why one of these rather than another should be operative on any given occasion. "If the sight of a picture, for example, can recall to me the person whom it resembles, the artist who painted it, the friend who presented it to me, the room in which it formerly was hung, the series of portraits of which it then formed a part, and perhaps many circumstances and events that have been accidentally connected with it, why does it suggest one of these . . . rather than the others?"[1] Stated in symbolic terms, the question is as follows: If *a* has become associated with *b*, *c*, and *d*, severally, why on any given occasion should it recall one of these, *b*, in preference to the others? Brown enumerates a number of special circumstances, depending on the conditions under which the association has been originally formed. The greater and more prolonged the attention given to *a* and *b* and to their connexion at the time they became associated, the firmer will be the association, and the stronger the tendency of *a* to recall *b*. Again, the frequency with which *a* and *b* have been previously combined is a very important factor. "It is thus we remember, after reading them three or four times over, the verses which we could not repeat,

[1] Thomas Brown, *Philosophy of the Human Mind*, vol. ii., pp. 271-272.

when we had read them only once."[1] We must also take account of the *recency* of the association. "Immediately after reading any single line of poetry, we are able to repeat it, though we may have paid no particular attention to it; in a very few minutes, unless when we have paid particular attention to it, we are no longer able to repeat it accurately, and in a very short time we forget it altogether."[2] Lastly, much depends on whether *b* has been associated in a similar way with other objects besides *a*. "The song, which we have never heard but from one person, can scarcely be heard again by us without recalling that person to our memory; but there is obviously much less chance of this particular suggestion, if we have heard the same air and words frequently sung by others."[3] As Dr. Ward remarks, "the average Englishman is continually surprised without his umbrella,"[4] just because the weather is so changeable that no fixed association can be formed.

These conditions are important. But other equally important factors are to be found, not in the conditions under which associations have been previously formed, but in the total mental state at the time when revival takes place. Those objects tend to be ideally re-instated which are relevant to the general trend of mental activity at the moment of recall. The sight of rain will suggest an umbrella if we are intending to go out; otherwise it may only suggest the idea of somebody else getting wet. If our minds are occupied with scientific discussion, the word *proofs* will suggest one group of ideas; if we are engaged in preparing a book for the press, it will suggest something quite different.

[1] *Op. cit.*, p. 273. [2] *Ibid.*, p. 274. [3] *Ibid.*
[4] Encyclopaedia article, p. 63.

Within the total object which engages our attention, special features which for any reason happen to be peculiarly interesting are more efficacious than others in determining the direction of recall. This is admirably brought out in the following illustration given by James. "After looking at my clock just now (1879) I found myself thinking of a recent resolution in the senate about our legal-tender notes. The clock called up the image of the man who had repaired its gong. He suggested the jeweller's shop where I had last seen him; that shop some shirt studs which I had bought there; they the value of gold and its recent decline; the latter the equal value of greenbacks, and this, naturally, the question of how long they were to last, and of the Bayard proposition. Each of these images offered various points of interest. Those which formed the turning points of my thought are easily assigned. The gong was momentarily the most interesting part of the clock, because from having begun with a beautiful tone, it had become discordant and aroused disappointment. But for this the clock might have suggested the friend who gave it to me, or any one of a thousand circumstances connected with clocks. The jeweller's shop suggested the studs, because they alone of all its contents were tinged with the egoistic interest of possession. This interest in the studs, their value, made me single out the material as its chief source, etc., to the end."[1]

§ 5. **Ideal Construction.**—We have seen in the last section that the total mental state, at the time at which ideal revival takes place, is a most important factor in determining what ideas shall be revived. We have now to add that the ideally revived objects are in various manners and degrees modified and transformed by the condi-

[1] James, *Principles*, vol. i., p. 573.

tions under which their re-instatement takes place. They enter into new combinations and acquire new relations, so that they appear under fresh aspects. If in the past the sight of a house has become associated with the ideal representation of a person living in it, whenever I see or think of the house I shall tend to think of the person inside it. Supposing that I see the house on fire, or hear that it is on fire, the ideal representation of the person who lives in it will be transformed by the special circumstances of the case. I shall think of him as in danger of being burnt. The same transforming influence also comes into play in association of similars. A draper serving at the counter may remind me by his personal appearance of Napoleon; but the special circumstances will tend to make me think of Napoleon in a special way. My mind will dwell on the contrast between the life of the great conqueror and that of the man before me.

In these instances, the object ideally recalled is modified by the relations into which it enters at the time of its recall. In some manner or degree, this always takes place. But there is another kind of transformation which becomes prominent only under special conditions. The ideally revived object may not only be modified by the new relations into which it enters; it may require to be modified as a pre-condition of its entering into these relations. The nature of any whole is determined, not merely by the nature of its constituent parts, but also by the form of their combination. Now suppose that we have two terms b and d so related as to form a whole bd. If the relation which constitutes this whole is to be maintained while one of its constituents is altered, it may be necessary for the other constituent to be changed in a corresponding manner. If instead of b we substitute β, we must substitute δ instead of d. A familiar illustration is supplied by

mathematical ratios. Suppose that we have given the ratio 1 : 4; if 1 be changed into 5, we must change 4 into 20, in order to preserve the same ratio.

Now in ideal revival based on preformed association it may and frequently does happen that the trend of mental activity at the moment requires the relation between the associated terms *b* and *d* to be re-instated. But the given term may be only similar to *b*, not identical in its nature with it. Let us call the given term β; β may so differ from *b* that it can no longer enter into the same relation with *d*, so as to form the same kind of whole. In order to re-constitute the form of combination characteristic of this whole, it may be necessary that the ideal revival should take the form δ instead of *d*.

A simple instance "is supplied by the singing or mental repetition of a tune in a different key from that in which it has been previously heard. The absolute pitch of the notes is determined by the keynote, which may vary. The identity of the tune is preserved by correspondence in the transitions between the notes."[1] To take an example of a very common type, suppose that the sight of a piece of sugar arouses the ideal representation of its sweetness. It is this special piece of sugar as seen by me at this moment which recalls the sweet taste. The special conditions operative at the moment of reproduction enter into and modify process and result. "If the sugar seen is beyond my reach, then the sweetness suggested is a sweetness beyond my reach, though in all my past experiences the sugar may have been easily attainable."[2] "Mr. Lloyd Morgan tells a story of a little boy who 'after gazing intently at a spirited picture of a storm at sea with a ship

[1] *Analytic Psychology*, vol. ii., p. 57.
[2] *Op. cit.*, pp. 44-45.

being struck by lightning, asked, Mother, why doesn't it rumble?' Now, what kind of a rumble was in this case actually suggested to the boy? Was it anything in the nature of a literal reproduction of any thunder-clap which he had ever heard? If he had heard an actual peal of thunder at the moment, this would not have fitted itself in as a natural complement of the painted scene. If his mother had told him that painted lightning could only be accompanied by painted thunder, the answer would in all probability have appeared to him a satisfactory one."[1] A little girl, playing with a doll, treats it as if it were a baby. The doll becomes a centre from which a train of associated ideas starts, analogous to those which would be suggested by a living child. But the fact that she has not to deal with a living child, but only with a doll, makes a difference. She puts food to its mouth, but does not expect the food to be swallowed.[2] She would certainly be very much startled if it actually began to cry. The train of ideas connected with babies is reproduced only in analogue.

In these examples, the relations which determine the ideal construction are revived by association. But in other cases, the form of combination is entirely determined by the predominant interest at the moment at which revival takes place; so that objects are brought into relations in which they have never occurred before. If a man is in the mood for making puns, or for drawing

[1] *Ibid.*, p. 46.

[2] "Some children, it seems, have a way of putting food on the floor near the doll; others go further, and hold the food long to the doll's mouth; or, insisting on a still more realistic performance, break out some of its teeth, and push the food into the mouth with a pin. Others, again, stopping short of such violent realism, cover the unreality by a dodge, as when one child, after holding the food to the doll's mouth for a while, slipped it down its neck." Sully, article on "Dollatry," *Contemporary Review*, Jan. 1899.

epigrammatic contrasts, or for tracing relations of cause and effect, these modes of combination will impose themselves on the objects revived by association, and will tend to transform these objects so far as may be necessary to make them fit into the relational scheme.

Differences in the mental constitution of individuals largely consist in differences in the kind of relation in which they are predominantly interested. Some attend by preference to mere relations of contiguity in time and space; others to metaphorical analogy; others to rhetorical contrast; others to logical connexion; and the kind of transition which is relatively dominant in the sequence of their ideas varies accordingly. In the mind of a schoolman, the ruling scheme of connexion was apt to be the form of the syllogism. In many minds, and especially in those which are saturated with the study of Hegel, a special form of transition is favoured, which consists in a triple movement, passing from a one-sided view of the case to the opposite one-sided view, and then to a more comprehensive view which embraces the two extremes in harmony.

Sometimes the modification needed to adapt the material supplied by association from past experience to its place in a new context takes place in the process of revival itself so that no further readjustment is required. The inveterate punster, for instance, may find himself mispronouncing a word without previously thinking of the right pronunciation or recognising that this requires to be altered for the purpose of the pun. The same holds for the recall of the successive notes of a tune when it is transposed from one key into another.

In the "inspired" work of genius, *e.g.* the musical compositions of Mozart, ideas emerge of themselves in a form already adapted to their place in the growing context of ideal construction. But in ordinary thinking, the

materials initially supplied by the play of association, for the most part, require to be re-moulded before they can be woven into the relational scheme. A high and smooth-barked tree has to be climbed. To think of steps does not of itself furnish an ideal path to the desired end. They must be steps of a special kind produced in a special way, *e.g.* steps cut successively in the bark by means of a knife, so that those first made may be used in order to make those higher up.

Or, to take an instance of a different kind, the novel writer is ever on the outlook for scenes, incidents and traits of character which may turn out useful to him in his literary work. He thus stores his mind with materials which the play of association will present to him as they are required. But in actually using them he will, in general, have to select and recast them so as to fit them into the development of his story.

A word in conclusion as to the ultimate nature of ideal construction. It is a common-place that the power of the mind to frame for itself new ideas is never creation out of nothing, but always consists, as Locke maintained, in separating and re-combining in fresh ways a material already at its disposal. But such words as "combining" and "separating" contain metaphors derived from the workmanship of human beings in the material world, the quarrying of stones, the building of houses, the chiselling of statues, and so forth. What is the real nature of the mental processes which are thus metaphorically described? It consists, we may answer, in the transition from the apprehension of the actual to the thought of the possible.

Possibility is essentially bound up with the existence of kinds or classes. Wherever a number of different objects share a common nature but exemplify this common nature each in its own special way, these special determinations

are what we call possible alternatives. All the things in this room have shape; but the shape of each is different. The particular shapes are all possible alternative specifications of the common character, shape. In the case supposed, these possible alternatives are also actual and apprehended by me as actual. But the common character is such, and is found by me, when I consider it, to be such, that the range of its alternative variations is not exhausted by the given particular examples or by any others which I can recall from past experience. On the contrary, I find that I am able to bring before my mind other possible variations which I have never perceived and perhaps never shall perceive. Similarly, human beings in general have height which varies from man to man; but in actual experience the variation is confined within definite limits. The limits are not, however, imposed by the general character itself or by the shape and proportions of the human body. Hence I can think of a man being a mile high or even picture him with his feet on the ground and his head in the clouds. These examples illustrate the essential nature of all ideal construction. It consists always in the discovery of fresh possibilities, possibilities relative to this or that general condition or conditions.

Viewed in this light, the constructive work of the mind is rather a *finding* than a making or producing. It is a finding of possibilities which have not been apprehended as actual. It is only on the side of immediate experience that it can be regarded as, in the strict sense, a production of something new. When we imagine a golden mountain, we do not make but discover the shape and size of a mountain as among the possible variations of shape and size in general; similarly, we do not make but discover gold as one of the alternative materials capable of having such size and shape. But if we bring before our minds this possible

alternative by means of a mental picture, the mental picture is a relatively new immediate experience. Both it and the mental disposition which it leaves behind are determined by our activity in attending. They are the workmanship of the mind and products of mental construction.

§ 6. **Obstructions in the Flow of Ideal Activity.**—Ideal activity, like perceptual activity, may be successful or unsuccessful. In so far as it is unsuccessful, it tends, like perceptual activity, to persist with variation of procedure. The tendency is of course proportioned to the strength of the interest involved.

The conditions which obstruct and delay the flow of ideas are of various kinds. The hitch may occur either on the reproductive or on the constructive side of the process. When it occurs on the reproductive side, it is merely what is called a failure to remember; as when we find ourselves unable to recall the name of a person or the title of a book. If we are sufficiently interested, such failure is followed by a more or less prolonged effort to recollect. In this effort we vary our procedure, using all the means which present themselves. Supposing it is the name of a person we are endeavouring to recall. We try various clues in succession. We fix attention on objects and circumstances connected with the person. We perhaps inquire of a bystander, or look in a book; or go through a list of names on the chance that we may hit on the right one. As in perceptual process, there is persistency with varied effort.

When the hitch occurs on the constructive side, the mental processes which are directed to overcome it may be extremely complex. The guessing of riddles furnishes a good example. We have ideally to reproduce something which shall satisfy all the conditions of the riddle. Certain relations are given, and we have to find another term which shall fit in with these in a harmonious whole.

We make trial after trial, we think of this, and then we think of that; but each suggested solution in turn, though it may fulfil part, fails to fulfil all conditions of the problem. Here too there is persistency with varied effort, comparable to the varied efforts of Mr. Thorndike's cats to escape from their cages. Finally we may or may not succeed in completing the ideal scheme, by making the right guess. We may take as another example a case in which the flow of ideas is controlled by the urgency of a practical need. Suppose a man shut up in prison and bent on devising a mode of escape. Let us assume that the main difficulty lies in the height which has to be descended before he can reach the ground. The notion of letting himself down from a height by means of a rope may be familiar to him by past experience: but in this case he has no rope. What he needs therefore is something which will take the place of a rope—something which will fit into his ideal scheme as the rope would if he had it. He may proceed to think of various expedients, and he may at last light on the idea of using his sheets and blankets. The first time this suggestion occurs to him, it may not help him out of his difficulty; but it comes nearer to what he wants than anything else he has thought of; therefore his mind tends to dwell on it, and to give it a new shape which will suit his purpose. At last he hits on the idea of tearing up the sheets and twisting them into a rope. Of course we are supposing that our supposed prisoner has not already heard of this expedient. We may assume that he is the first man who invented it. In this, as in similar instances, association by similarity plays an important part. His own case calls up to the mind of the man analogous cases in which ropes have been used. He then proceeds to work out his own case on parallel lines, in so far as the circumstances will admit.

CHAPTER III.

MEMORY.

§ 1. **Definition of Memory.**—Sometimes the word *memory* is used as synonymous with *retentiveness* in general. This application of the term is inconveniently wide. It is better to confine it to ideal revival, so far as ideal revival is merely reproductive, and does not involve transformation of what is revived in accordance with present conditions. This reproductive aspect of ideal revival is best exemplified in those cases in which the controlling interest requires the objects of past experiences to be re-instated as far as possible in the order and manner of their original occurrence. Hence the word *memory* is applied with special appropriateness to these cases. A witness giving evidence in a law-court is a typical example. His mind is bent on recalling past objects and events, as they actually occurred in his previous experience, omitting the inferences which he has subsequently drawn from them, or is inclined to draw at the present moment. The inferences which he drew from them when they occurred he recalls as far as possible only as inferences, and not as actual percepts.

The witness in a law-court recalls his own personal experiences as far as possible in the same time-relations in which they actually occurred. This may be called *reminiscence* or *personal memory*; but there is a large class of cases in which memory is impersonal. What is remembered in these instances is the knowledge acquired by personal

experience, and not the particular incidents connected with the process of acquiring it. When a boy first begins to study his Euclid, his natural tendency is to learn the propositions by heart, so as to reproduce the very words of the book. When the process of learning is complete, what remains in his mind may be only the general method of proof. He will to a large extent have forgotten the words of the book, and he will certainly have forgotten much that happened in the process of learning; the particular occasions on which he sat down with Euclid in hand to learn a proposition; his blunders in attempting to reproduce it, and so on. He will finally tend to recall only what he has an interest in recalling, forgetting what is irrelevant. The process is quite analogous to the formation of habits of thinking and acting. As in the formation of habit, two distinct conditions are involved: The first is retentiveness; the second lies in the essential nature of conation, according to which conative processes cease, if and so far as their end is attained. This holds good even in learning by rote. In learning by rote the dates of accession and death of the kings of England, a boy will go over them again and again in his book, and will again and again attempt to repeat them; but in the long run he will forget these particular incidents. He will forget his successive attempts to "commit to memory" and his occasional failures and errors in attempting to reproduce.

§ 2. **Good and Bad Memory.**—The marks of a good memory are, (1) The rapidity with which the power of recalling an experience is acquired; (2) The length of time during which the power of remembering lasts without being refreshed; (3) The rapidity and accuracy of the actual revival. Some persons can learn quickly and easily, but soon forget; others take a long time to learn, but also

retain for a long time what they have once learned. Even when memory is retentive, so that what is once learned is not easily forgotten, there may yet be slowness and hesitancy in the actual process of reminiscence.

As a fourth mark of good memory, we may mention its *serviceableness*, or in other words the readiness with which it reproduces what is relevant to the prevailing interest of the moment. A memory may be extremely extensive without being in this sense serviceable. Dominie Sampson's mind, for instance, was like "the magazine of a pawnbroker, stowed with goods of every description, but so cumbrously piled together, and in such total disorganisation, that the owner can never lay his hands on any one article at the moment he has occasion for it." [1] Those who cram for examinations often realise this in a painful manner. So long as the questions are straightforward, so that the answers may be taken directly from the books they have used, they may find no difficulty. But as soon as a question is asked which requires them to record their acquired knowledge in a different order and manner from that in which it is given in their text-book, they break down. The materials for an answer may really be contained in what they have learned, and yet they may not be able to recall what is wanted, because the particular question has never been associated in their minds with the particular answer.

The rapidity with which the power of recalling is acquired depends to a large extent on the keenness of the interest attaching to the original experience. Much that attracts attention only transiently and faintly fails to be remembered at all. It is to be noted that we tend to remember, not only what is in itself interesting, but also

[1] *Guy Mannering*, ch. xxxix.

connected circumstances which may in themselves have little interest. A young child takes little interest in the alphabet for its own sake, but if the letters are made of gingerbread, it is more likely to remember them. So far as the power of acquiring a memory does not depend on interest, it must be set down to the account of congenital constitution. But native capacity for remembering is, for the most part, connected with native capacity for interest in what is remembered. Mozart as a boy of fourteen years old could write down from memory an extremely complex piece of music after having heard it only once; but the musical genius of Mozart caused him to take a most intense and absorbing interest in the actual hearing of music. Some idiots show remarkable power of memory. They can for instance repeat long lists of disconnected words which they have heard only once. Probably this is connected with the fact that the range of interest in the idiot is excessively narrow and correspondingly concentrated. They are scarcely capable of apprehending any relations except those of bare contiguity in time and space. Hence their remarkable powers of recalling series of objects which are only connected in this manner. There are no other divergent lines of association to compete with those which are formed by the mere sequence of external impressions.

Differences in the length of time during which the power of recall is retained also depend largely on interest. It is to be remarked that the kind of interest which facilitates the acquisition of memory is not necessarily the same as that which is most effective in causing its permanent retention. The barrister learns the facts bearing on a particular case, but rapidly forgets many of them, which have only a transient interest, when the case is over. The properly legal aspects of the case, on the contrary, will tend to be retained because he has in them a permanent interest.

Another very important factor in determining duration of the power of recall is the frequency with which the remembered experience has been repeated. A boy learning a passage by heart will go over it again and again until he has thoroughly stamped it in. Differences in the retentiveness of memory which are not traceable either to interest or to frequent repetition must be referred to congenital constitution. Here again it is doubtful how far congenital constitution can favour memory without favouring interest.

The conditions on which serviceableness depends are of a different kind. A man who can readily recall what he needs at the time he needs it is said to have his knowledge well-arranged or organised. The mass of his acquirements may be much smaller than that of another man whose knowledge takes the form of cumbrous and disjointed erudition. Yet his memory may be incomparably more effective both for practical and theoretical purposes, and even in the answering of examination papers. To understand the distinction we must note that a man may be perfectly able to call something to mind when a certain prompting cue is given, and quite unable to do so in the absence of this cue. I may be quite able to recall a line of verse if I have first heard or recalled the previous lines; but I may be quite unable to recall the same line of verse as a quotation illustrating some point in which I am interested at the moment. The reason is that I have never thought of the meaning of this line of verse, or of similar objects, in connexion with this particular point or similar points. It is not necessary that the particular line of verse should have been thought of in a special connexion for it to be recalled in this connexion. All that is necessary is that the general kind of relation involved should be more or less familiar to the mind. I may for instance

wish to illustrate the fact that in poetic metaphor the connexion between the metaphorical expression and the reality which it expresses is often identity in the form of combination of a complex whole rather than identity in the nature of its material constituents. For this purpose I may quote Tennyson's line,

"A doubtful throne is ice in summer seas."

A throne is not in the least like ice, nor the dangers to which it is exposed like the warmth of summer seas. There is only analogy of relation. Now for this line of Tennyson to occur to me as an illustration of my point, it is not necessary that I should have thought of it before in this connexion. But it is necessary that I should previously have thought of other similar illustrations. The more I have done this, so as to familiarise myself with this kind of mental transition, the more readily shall I be able both to recall old illustrations and to produce new ones. Thus we may say that the serviceableness of memory depends on our forming the right kind of associations. The tendency of *A* to recall *B* in a certain kind of relation, *r*, depends on our having previously attended to *A* and *B* in this relation, or to things similar to *A* and *B* in similar relations.

§ 3. **Decay of Memory with Lapse of Time.**—Though particular memories last for various periods in different cases and with different persons, yet it is the general law that they tend to die away in course of time if they are not refreshed. Professor Ebbinghaus has made experiments with the view of determining the quantitative relation between lapse of time and decay of the power of recall. For this purpose he learnt by heart lists of unmeaning syllables of three letters each; each list contained from twelve to thirty-six syllables. After learning a list

so as to be able to repeat it, an interval of time was allowed to intervene before again attempting to recall the syllables. Memory had in the interim become more or less partial and fragmentary. The point of the experiment was to determine the amount of time required for re-learning the list as compared with the time originally required. This yields a measure of the degree of decay of the mental dispositions, and shows the relation between decay and lapse of time. After an interval of 20 minutes, about 40 per cent. of the original time was required for re-learning, after 64 minutes, about 56 per cent., after 526 minutes, about 65 per cent., after two days, about 72 per cent., and so on. From this we see that, though the amount of decay increases with the lapse of time, yet relatively it is smaller the longer the interval.

§ 4. **Variety of Memories.**—In ordinary language we speak of a person having a good memory for numbers but a bad one for names, a good memory for places but a bad one for faces, and so on. Theoretically, we must carry this division very much further. As memory consists in the power of ideal revival, there must be a relatively separate memory for every experience ideally revived. There must not only be a separate memory for names, but a separate memory for each particular name.

But ordinary language is undoubtedly right in recognising distinct memories for general departments of experience. Mozart had an extraordinary memory for music; but he may have been very bad at recalling numbers. The most wonderful memory for words may be accompanied by a poor memory for dates and events. These differences are very largely due to congenital constitution; but special kinds of memory may also be cultivated.

§ 5. **Improvement of Memory by Practice.**—It is certainly true that the exercise of memory in a special direction improves it in that direction. By long practice actors come to learn their parts more rapidly and easily. The same is true of clergymen who learn their sermons by heart. These effects of practice appear to be strictly confined to the special kinds of ideal revival which are exercised. A man who improves his memory for words does not thereby improve his memory for places.

There is reason for denying that memory can be *directly* improved by practice. The power of remembering depends on the kind and degree of attention given to the original experience. It would seem that what is educated by practice is the attention, and not the power of recall. Professor James is probably right in maintaining that "all improvement of memory consists in the improvement of one's habitual method of recording facts."[1] It is the power of learning, not the power of retaining, which is increased by practice. "I have," says James, "carefully questioned several mature actors on the point, and all have denied that the practice of learning parts has made any such difference as is alleged. What it has done for them is to improve their power of *studying* a part systematically. Their mind is now full of precedents in the way of intonation, emphasis, gesticulation."[2] There can be little doubt that Professor James is right in assigning increased and better directed attention as the ultimate cause of the improvement of memory by practice. The endeavour to remember is an endeavour to attend; and by repeated and prolonged attention to objects, we not only make the traces more permanent which our experience of them leaves

[1] *Principles of Psychology*, vol. i., p. 667.
[2] *Ibid.*, p. 664.

behind; we also bring them into relation with other objects, and so multiply the associations which may severally and conjointly contribute to their revival.

On this view, the power of retentiveness is born with each individual as an essential part of his general physiological constitution. It is "a physiological quality, given once for all with his organisation, and which he can never hope to change. It differs no doubt in disease and health; and it is a fact of observation that it is better in fresh and vigorous hours than when we are fagged or ill. . . . But more than this we cannot say."[1]

In order to understand the improvement of memory by practice, we must recur to a point already explained in discussing the revival of similars. Similar experiences, so far as the similarity extends, have the same mental disposition corresponding to them. This is peculiarly clear in association by similarity. One man, by some similarity in his personal appearance, may remind me of another; I may not discover, even after careful scrutiny, what the point of resemblance is. It has not formed a separate link of association. Yet the disposition left behind by my experience of the one person has been re-excited by the sight of the other. The dispositions left behind by the two experiences must therefore have some common factor. They must partially interpenetrate. In general, so far as the revival of similars by similars is possible, there must be a partial coincidence of mental dispositions. The same applies to association by contiguity. If β recalls γ because b and c have been associated, the disposition left behind by b must be partially re-excited on the occurrence of β; the dispositions left behind by b and β cannot therefore be absolutely independent.

[1] *Op. cit.*, p. 664.

Just in so far as this interpenetration of mental dispositions exists, the exercise of the memory for certain experiences will improve the memory for analogous experiences. When a man has made a certain amount of progress in the learning of a foreign language, further progress is facilitated, just because he has become familiar with certain general characteristics of the language, which do not need to be learnt over again for every particular case. Of course it does not follow that memory in general is improved by its exercise in this or that particular direction. The progress will only extend to analogous experiences in precise proportion to the degree of analogy. Exercise of the memory in the study of languages will do little to improve it for the retention of chemical formulae.

§ 6. **Memory and Past Time.**—There is one most important aspect of memory which we have not touched upon. When we remember objects or events, we often apprehend them as having been presented to us in our past experience. It is not necessary or convenient to discuss this point now. It is part of the general question of the origin and development of the ideal representation of time-relations, which will be discussed in the chapters on "The World as Ideal Construction" and "The Self as Ideal Construction."

CHAPTER IV.

Ideation, Comparison, and Conception.

§ 1. **Ideal Pre-arrangement distinguished from Perceptual Pre-adjustment.**—Perceptual activity is guided by the actual presence of perceived objects. It is true that perceptual activity constantly involves pre-adjustment of the body and sense-organs for coming impressions. But this pre-adjustment is directly prompted by present or past impressions, and it consists, not in a pre-determination of the future, but merely in an appropriate *waiting* attitude. The only means by which the perceptual consciousness can control the course of its experience is through actual bodily movement. But no bodily movement can overleap a period of time. The most agile animal cannot take a spring into the future. But in trains of ideas we can transport ourselves into the future. We can begin by the ideal anticipation of the end, and we can move freely to and fro over the series of links intervening between end and starting point. Thus, if we meet a difficulty midway in the series, we need not provide for that difficulty at the point where it emerges. We may go backward to an earlier stage or even to the beginning, and there make a suitable re-arrangement. It is plain that the process admits of all kinds of variations, and re-adjustments of part to part, which are impossible for perceptual consciousness.

§ 2. **Conceptual Analysis and Synthesis.**—All ideational activity as compared with perceptual activity involves some

kind and degree of generalisation. We have seen that mental images are in general fainter and much less detailed than the corresponding impressions. They lack the determinate particularity of actual sense-experience. But indeterminateness in the image involves indeterminateness in the meaning of the image in so far as expression of the meaning depends merely on the presence of the image without being otherwise defined and developed. Hence any given mental image taken by itself may be equally capable of representing a great number of diverse objects. If I think of wealth, I may have in my mind a vague mental picture of a bale of goods: but the same mental image might equally have been present in my mind had I been thinking of a wharf, of commerce, or of a warehouse. Similarly, a bag of sovereigns might stand either for wealth, or a miser, or the Bank of England. The mental picture of a spade might stand either for the act of digging, for a garden, for a navvy, or for a grave-digger. But the mere indeterminateness of the mental image is very far from explaining the beginnings of general ideas. We give an essentially inadequate view of the generalising function of thought, when we dwell exclusively on what it omits. This negative side of the process has for its indispensable correlate a positive side. In any train of thought, we are under the guidance of a controlling interest constructing an ideal whole. Each of the several ideal representations which successively emerge contributes its part to this ideal structure. The details of actual perception which are omitted in the ideal representation are omitted because they will not fit in to our ideal combinations. We can no more use the complete details of actual perception in building up our mental structure than we can use unhewn stones in building a house. But in this account of the matter it is indirectly implied that the indeterminateness of ideal

representation is compensated for by another kind of determination. What is vague and indefinite in the several images and their meanings is made relatively definite and complete by the combination of ideas as the train of thought advances. What is wanting in the several ideas is supplemented by their relations to each other in the ideal whole. Thus we have side by side a process of analysis and one of synthesis. By the process of analysis, the concrete detail of actual sense-perception is broken up, and certain aspects of it selected. In contrast with the concrete totality of perception, these partial aspects have a more or less general or *conceptual* character. The analysis may therefore be called *conceptual analysis*, and the corresponding synthesis, *conceptual synthesis*. By conceptual synthesis, the partial aspects are recombined into a new whole. Similarly, in building a house, we have first to go to the quarry and detach the single stones from it, afterwards hew them into shape and then build with them a new structure. This may be illustrated by the simple recall of a series of events in the order in which they actually occurred in sense-experience, or of a number of objects in the order in which they were actually presented in space. The word *now* and the word *here* have different meanings from the point of view of sense-perception and of ideal recall. From the point of view of sense-perception the word *now* always means the actual moment of sensation, and *here* means the direct presence of an object to our percipient organism, as immediately revealed by the sensation which it produces. But in ideally recalling a series of events in time, or a grouping of objects in space, actual sensation is absent, and can no longer serve as a distinguishing mark of what is *now* present or what is *here* present. The individualising details of present perception are to a very large extent absent from the ideal reproduction. The *now* and the *here*

must therefore be otherwise defined. In fact, they are defined by the combinations into which they enter. They become purely relative terms. To go back to an old example, suppose that I picture myself as eating my breakfast.[1] I pass in review successive events. I mentally enter the breakfast-room; then sit down at the table; then pour out the tea; then open a newspaper; then help myself to fish, and so on. If I want to represent vividly what took place, I may say *now* instead of *then*, and think in the historic present. Now I am entering the breakfast-room, now I am sitting down, now I am pouring out the tea, and so on. Whether I say *now* or *then*, obviously what I am doing is to define the temporal position of each event by its relation to others in a series. The word *now* becomes purely relative in its application. Any part of the series may be regarded as a *now* in relation to what comes before it and what comes after it. Similarly, by changing the point of view, any part of the series which was previously regarded as a *now*, may become a *then*. It all depends upon our point of departure. If we mentally pass from an earlier part of the train to a later, what was previously a *now* becomes a *then*, what was previously future becomes present or past, and so on.

This example is typical. In all trains of ideational thinking, the several parts are made definite and determinate by their relations within the ideal whole which

[1] I have supposed this train of ideas to take place by means of a series of visual images. I have done so because the treatment of the function of language is reserved for the next chapter. But as a matter of fact most people would naturally recall a series of past events in the way of verbal description, either as a substitute for, or an accompaniment of, verbal imagery. It is the peculiarity of words that they are indeterminate in their meaning, not in their nature as mental images.

is being constructed. In this way the concrete determinateness of sense-perception is replaced by a new kind of determinateness, that which is due to *conceptual* synthesis. In this sense we may adapt the dictum of Hegel, that thought passes always from the abstract to the concrete. One abstraction combines with and supplements another, so as to make the whole more and more concrete. The concreteness thus attained is of course different in kind from that of actual perception, and must always fall short of it. But it is at least equally true that the concreteness of actual perception falls short of that which is attained by ideal synthesis. In the process of ideal synthesis distinctions and relations are apprehended of which sense-perception can never become aware. By ideal combination the world comes to be presented as a unified system of which only a very small part is ever actually present to the senses of an individual percipient. Thus sense-perception is fragmentary as compared with ideal combination, and in this sense is less concrete.

§ 3. **Comparison.**—"The growing mind, we may suppose, passes beyond simple perception when some striking difference in what is at the moment perceived is the occasion of a conflict of presentations. The stalking hunter is not instantly recognised as the destroying biped, because he crawls on all fours: or the scarecrow looks like him, and yet not like him, for, though it stands on two legs, it never moves. There is no immediate assimilation; percept and idea remain distinct till, on being severally attended to and compared, what is there is known in spite of the differences."[1]

[1] Ward, article "Psychology" in *Encyclopaedia Britannica*, ninth edition, xx., p. 78.

Such a comparison is a complex process, involving a series of judgments, such as—"It crawls; It does not move; and the like."[1] There are abundant occasions in animal life which might usefully call into play mental operations of this kind. Whenever things are in appearance different, although they are for practical purposes the same, or whenever they are in appearance similar, although for practical purposes they differ, a problem arises which would be most effectively solved by deliberate comparison. By deliberate comparison I mean a mental confronting of the two objects, and a transition of attention from the one to the other, so as to discover some respect in which similar things differ in spite of their similarity, or in which different things agree in spite of their diversity, and also a fixing of the precise nature of this agreement or difference. If an unpalatable moth resembles in its markings a palatable moth, a bird will be apt to confuse them, and so meet with disagreeable disappointment. The bird might conceivably attempt to overcome the difficulty by setting a specimen of the disagreeable species side by side with one of the agreeable species, and then, examining them alternately, might consider first one character and then another of each, so as to find out distinguishing differences. Or again, without bringing the two actual objects together, it might examine the one as perceived and the other as ideally represented, and go through the same process. This would be much harder because it would require a strong and persistent effort to keep before the mind a sufficiently accurate idea of the absent object. Now the supposed case of the bird actually confronting the two objects, alternately scrutinising each, and passing in turn

[1] *Ibid.*

from one characteristic to another, has a strong air of improbability. As a matter of fact, we rarely observe animals behaving in such a manner as to make this interpretation of their actions necessary or even probable. But if they do not usually compare two objects when both are perceived, it is *a fortiori* unlikely that they should do so when one has to be ideally recalled, for, as we have said, this is the harder task. In fact, we have good reason to re-affirm Locke's dictum that "brutes compare but imperfectly." "It seems to me," he says, "to be the prerogative of human understanding, . . . when it has sufficiently distinguished any ideas, . . . to cast about and consider in what circumstances they are capable to be compared."[1]

We have seen that systematic observation of animals confirms this view. It is the one result most distinctly brought out in Mr. Lloyd Morgan's book on *Comparative Psychology*. I may here quote an experiment which he carried out with great care and patience. Taking with him a dog which had been trained to fetch and carry, he threw a stick into a field surrounded by railings. The dog bounded after the stick, and brought it back in his mouth as far as the railings. But here he was confronted with a difficulty; he could get through himself, but he could not get the stick through. His experience had not taught him that the only way of succeeding was by grasping the end of the stick; instead of this, he tugged now here, now there, in a perfectly uncritical way. If, by accident, he did get hold of the right end of the stick, or if Mr. Morgan showed him how to proceed, this seemed to yield him no assistance on the repetition of

[1] Locke's *Essay concerning Human Understanding* (Fraser), vol. i., pp. 204-205.

the experiment. He had stumbled on the solution, but could not do the trick again. This was no casual observation; it was a systematic experiment repeated day after day, and only one of a course of similar experiments. It is evident that the dog here passed from one alternative to another without selective comparison; so that when he hit on the right one or was shown it, he failed to note the points in which it differed from unsuccessful attempts.

Comparison in all but a most rudimentary form involves free ideas. Even when the objects compared are both present to the senses, each is scrutinised in turn. For anything more than a vague awareness of resemblance or difference, it is necessary to keep before the mind the ideal representation of the one object in the very act of examining the other. Only in this way can each detail and characteristic in turn be selected for comparison, so as to distinguish the points of difference from the points of agreement. Hence we may attribute the rarity of comparison in animals, in all but its most vague and rudimentary form, to the absence or imperfect development of free ideas.

When the process of deliberate comparison plays an important part in the mental life, it involves a corresponding development in conceptual thinking, in the distinction of the general or universal from the particular. To compare deliberately is always to compare in some special respect. Some theoretical or practical end is to be subserved by the comparison. The difference or agreement to be discovered is not *any* difference or agreement, but one which has significance for the guidance of conduct or for the solution of a theoretical difficulty. Thus comparison takes place only in regard to the characteristics which happen to be interesting at the moment, other

characteristics being disregarded or set aside as unimportant. Objects in other ways most diverse may yet in a certain respect be compared and found more or less similar, and objects in other ways very similar may be compared in a certain respect and found more or less unlike. Hence, as the process advances it becomes possible to group objects according to the degrees of their difference or resemblance in this or that respect without taking into account their other attributes. We may arrange musical tones according to the degree of their loudness disregarding their pitch, or according to their pitch disregarding their loudness. In the scale of loudness, sounds most different in pitch might occupy the same position, and sounds of the same pitch widely different positions. A shrill note and a low one may be of equal loudness, and sounds of the same pitch may be of different loudness.

It is evident that in this way what we have called the conceptual analysis of the concrete details of sense-perception receives a great development. A complex object becomes mentally separated into a plurality of partial aspects, each of which can form a starting-point for a series of comparisons, giving rise to different series of graduated resemblances such as those of pitch and loudness, and objects which are far apart in one series will be close together in another. To each of the different series there corresponds an abstract character or attribute of the object consciously distinguished from other abstract characters or attributes. Thus the category of Thinghood assumes a new form in ideational thinking from that which attaches to it in perceptual. The unity of the thing is explicitly distinguished from the plurality of its qualities, and that kind of predication becomes possible which is embodied in Language. The necessity of doing one thing

at a time has led us to describe the nature and progress of comparison without reference to the use of language. But in fact the ideational activity which comparison involves could not proceed far unless it were guided and supported by expressive signs, *i.e.* signs directly expressing free ideas and their relations. The nature, function, and origin of these signs is the topic which will next occupy us.

CHAPTER V.

Language and Conception.

§ 1. **Language as an Instrument of Conceptual Analysis and Synthesis.**—In speaking of Language, we must remember that what primarily concerns the psychologist is not any special system of external signs such as gestures, articulate sounds, or written characters, but a certain psychical function—a peculiar mode of mental activity. It is a unique and most important characteristic of this function or activity that many minds can co-operate in it as if they constituted a single mind. But the possibility of this co-operative thinking must be grounded in the nature of the mental process as it takes place in the individual mind. I do not mean that the use of language in individual thinking was or could be prior to its use as a means of intercommunication. What I do mean is that the earliest communication concerning objects outside the range of present perception could only take place between minds capable of a certain kind of mental process. In order that *A* and *B* may interchange ideas, instead of merely pointing to percepts, it is evident that they must start from a previous basis of common experience. It is impossible to discuss Greek particles with a person who does not know a word of Greek. But if communication is to be real and valuable, it must be possible for *A* not merely to convey to *B* what *B* already knows, but also what he does not know. *A* must be able to communicate to *B* something of which *A* has had experience and of which

B has not had experience. How is this possible? Let us consider an analogous case. I wish to show someone how to pronounce a word which he has never heard. He is either deaf or at a distance, so that I cannot adopt the simple expedient of pronouncing it myself in his presence. My only resource is to write it down for him in phonetic spelling. I thus convey to him the new sound by exhibiting it as a combination of sounds with which he is already familiar. I reconstruct it and thus enable him to reconstruct it out of its phonetic elements. In like manner, *A* can communicate a new fact to *B* by reconstructing it out of elements which *B* has become acquainted with in the course of his previous experience. Intercommunication of ideas therefore implies analysis of the objects and processes presented to perception into certain constituents which recur in varying combinations in various particular cases. The use of language involves ideal analysis of objects and processes into common factors and their free reconstruction out of these common factors.

It must not, however, be supposed that these common factors have each a rigid and unalterable nature which remains unchanged in the various combinations into which they enter. They are not like printers' types, which merely change their mode of external juxtaposition without inward modification. On the contrary, the elements which are being continually combined in all kinds of varying ways in spoken or written discourse mutually modify each other. The meaning of a word varies with its context. Paul emphasises this point in his valuable work, the *Principles of the History of Language*. "In sentences like, 'I never laid a hand upon him'; 'John never drew bridle,' the hand referred to is not a hand in general, but my hand, the bridle referred to is not a bridle in general, but that which was held by John. Compare such instances

as 'a good point,' 'a point of honour,' 'the bar of an hotel,' 'the bar of justice,' 'the tongue of a woman,' 'the tongue of a balance.'"[1] The special meaning assumed by a word in a special context or special circumstances may be called its *occasional meaning*. It is only at a late stage of mental development that an express attempt is made to distinguish an identical and persistent element of meaning pervading the varying occasional significations of a word. When the attempt is made it constitutes an epoch in the history of thought. It is the beginning of definition and of the scientific concept. In popular and pre-scientific thinking the occasional meaning is the only one which comes to clear consciousness.

It follows from this account of language as a means of communication that words and their combinations express that process of analysis and synthesis which is essentially involved in trains of free ideas. The use of language presupposes the breaking up of the concrete content of actual perception into its partial aspects and constituents, and the re-combination of these to form new ideal wholes. The variation of meaning with context is due to the nature of the constructive process. The word only calls up what is relevant to the controlling interest guiding the train of thought.

Conceptual analysis and correlative synthesis would seem from this account of the matter to be a prior condition of the existence of language. In logical strictness this is so, but it is equally true that conceptual thinking could only exist in a most rudimentary and inchoate form apart from the use of some kind of expressive signs. Language is not merely an accompaniment of conceptual activity; it is an

[1] Ch. iv., p. 73. It will repay the student to read the whole chapter.

instrument essential to its development. It is an appropriate means of fixing attention upon ideally represented objects as distinguished from percepts. It becomes the more necessary the more abstract ideal representation is—in other words, the less it contains of the concrete details of actual sense-perception. The precise mode in which expressive signs serve to fix attention on ideas will be considered later on. Here we content ourselves with provisionally affirming that language in some form is an indispensable tool to think with. Within the mind of the individual thinker it serves to fix attention on his own ideas; in communication with others, it serves to fix the attention of the hearer on the ideally represented objects present to the mind of the speaker.

For illustration of conceptual analysis and synthesis, we may take any sentence or intelligible combination of words. Each word stands for some general aspect of the concrete detail of actual perception—in other words, it stands for what is called a *universal* or *concept*. The universals expressed by the several words combine in a unity, each helping to determine and particularise the rest, so as to form an ideal whole. Take such a sentence as "Nansen skates." "Nansen" is a proper name, and may therefore be supposed to stand for a particular, not for a universal. This is true from a certain point of view. The word "Nansen" designates a particular human being. But from another point of view it stands for a universal. The individual Nansen is a universal as the unity and connecting identity of his own manifold and varying states, relations, qualities, and activities. Nansen as perceived must be Nansen eating, or Nansen sleeping, or Nansen lecturing, or Nansen skating, or determined in some other specific way. But the word "Nansen" by itself does not stand for any of these particular determinations rather than others. It

stands for Nansen in general. The word "skates" particularises the universal "Nansen." But it does so by means of another universal. Other people skate besides Nansen, in varying manners and in varying times and places. Thus the universal "skating" not only particularises the universal "Nansen," but receives particular determination from it. The skating is not any skating, but the skating of Nansen. Now if instead of framing the proposition "Nansen skates," we actually saw him skating without any inward or outward translation of the experience into words or equivalent signs, there need be no such explicit contradistinction between the agent in general and his particular act, or between the act in general and the particular agent. The psychical function, then, which is involved in the use of language, is conceptual analysis and synthesis. *Discourse* is the expression of *discursive* thinking.

We now pass to an old and well-worn problem—that of the origin of language. Of course the question is not capable of what may be called a historical answer. There are no records or remains of remote pre-historic ages which would enable us to state on historical evidence the circumstances under which intercommunication of ideas by means of expressive signs first originated. But we are by no means at a loss on that account. Language actually grows and develops under our eyes, and we can apply the general laws of its growth and development to account for its origin. Besides this, we have in savage races examples of stages of mental development more rudimentary than our own; and by noting the points in which they differ from us we may obtain a clue to the nature of the differences between ourselves and primitive man.

§ 2. The Motor Element in Ideal Revival.—Perceptual process is penetrated through and through by experiences

of movement. Passive sensations only serve to guide and define motor activities. Besides the movements which directly subserve the attainment of practical ends, there are also constantly present the adjustments of the organs of sense involved in attending to percepts. There are the movements of exploration by which touch and sight follow the contours of objects. There are the attitudes of listening for sounds, and sniffing for smells, and the like. Ideal process, being a reproduction of perceptual, tends to reinstate the movements which form an essential part of it. The tendency is stronger in proportion to the vividness and distinctness of the mental imagery. In mentally reproducing the visual appearance of a thing we may mentally follow the outline of it with the eye, and in general we tend to repeat in idea the movements of ocular adjustment. Similarly, in recalling a sound, we may mentally repeat the attitude of listening, or better still, mentally imitate the movements by which the sound is produced. If it is a sound which we are able more or less successfully to imitate by means of our own vocal organs, we mentally articulate it. Our power in this respect is greatest with the words of ordinary speech, so that when we recall them in the form of mental images, we constantly reproduce the motor process of articulation as well as the mere sound.

This revived motor element has a peculiar importance, because our power of freely controlling, detaining, modifying, and repeating mental images depends in a large measure on our power of controlling their motor constituents or accompaniments. "The reason why revived movement is capable of discharging this special function is that our control over it is analogous to our power of controlling actual movements."[1] To show that this is so,

[1] *Analytic Psychology*, vol. i., p. 213.

we have only to point out that the more intimately a given experience is connected with motor processes peculiar to it and distinctive of it, the greater is our command over it in ideal representation, *ceteris paribus*. A good example is supplied by the articulate sounds of ordinary speech. Let anyone who habitually uses this form of verbal imagery select for mental experimentation any word or sentence; he will find that he has almost as great a control over the internal articulation as over the external. The chief restriction appears to lie in the inability to make the represented sound as loud as the actual sensation; but, apart from this, one may do almost what one likes with it. He may repeat it as often as he chooses with unfailing definiteness, precision, and certainty; he may say it rapidly or slowly, with emphasis or without emphasis or with emphasis that varies; he may even invert the order of the sound with as much freedom as in actual utterance. The same holds good with the simpler geometrical figures. We can trace them mentally much as we trace them physically. Contrast such cases as that of smells, or of organic sensations. Some persons can mentally reproduce odours with great vividness and accuracy; but vivid and accurate reproduction is one thing, and free control is another. We cannot, as in the case of articulate words, pass from one odour to another in a series, with greater or less rapidity, varying the order of succession according to our caprice or convenience. We cannot repeat the same odour as often as we choose with unfailing definiteness, precision, and certainty; we cannot vary its intensity at will as we can the loudness of articulate sounds. So far as we have any power in this respect, it appears to be indirect and depends on the recall of the appearance of odorous objects or of other associated circumstances. We cannot simply take some smell, and in idea freely run up

and down the scale of its varying intensities; according to all analogy, we should be able to do this, if we possessed and habitually exercised the power of actually producing the smell, and varying its intensity by our own movements.

It is in the motor elements of the mental image, and in the control which they yield over the image as a whole, that we have ultimately to look for the origin of expressive signs, or in other words, of language, in the broadest sense of the term. We have said that language is an appropriate means of fixing attention on ideally represented objects, as distinguished from perceived objects. Since the means of controlling ideal representations lies in the motor constituents of mental images, the source of language must be found here or nowhere. The first definite stage in the development of expressive signs is constituted by the tendency of ideas in so far as they have a motor aspect to issue in actual movements.

§ 3. Tendency of Motor Reproduction to pass into Actual Movement.—No one has done more than Dr. Bain to bring into prominence the importance of the motor constituents of ideas, and he has also laid great emphasis on the tendency of ideal movement to pass into actual movement. In the mental revival of experiences of energetic action, "it is," he says, "a notorious circumstance that, if there be much excitement attending the recollection, we can only with great difficulty prevent ourselves from getting up to repeat them. . . . A child cannot describe anything that it was engaged in, without acting it out to the full length that the circumstances will permit. . . . No better example could be furnished than the vocal recollections. When we recall the impression of a word or a sentence, if we do not speak it out, we feel the twitter of the organs just about to come to that point. The articulating parts

—the larynx, the tongue, the lips—are all sensibly excited. . . . Some persons of weak or incontinent nerves can hardly think without muttering—they talk to themselves."[1]

"Thinking is restrained speaking or acting."[2] Since Dr. Bain first wrote these words, psychological investigation has strongly confirmed their general purport. The tendency of ideas to act themselves out is now a commonplace of psychology. Probably Dr. Bain exaggerates the degree in which this tendency is ordinarily realised. The twitter of the organs of speech about to come to the point is not a constant feature of inward articulations in all persons. But there is no doubt that it is very frequent, and in some people almost invariably present. In what he says about thinking aloud, he rather understates his case; this habit is by no means confined to persons of "weak or incontinent" nerves. It is often found in those who become intensely absorbed in their own trains of thought to the disregard of their social surroundings. Social convention has a great deal to do with the restraint which we ordinarily put on the actual utterance of the thoughts which pass through our minds.

The general theory of the tendency of ideas to pass into movements is as follows. Ideational process is correlated with brain process. The brain is so intimately one with the rest of the organism, that processes in it cannot take place without in some measure overflowing to other parts of the body; and in particular to those parts with which it is most directly connected—the muscles. The whole complex apparatus of efferent nerves creates a functional unity between brain and muscle. This overflow of excita-

[1] *The Senses and the Intellect*, fourth edition, p. 357.
[2] *Op. cit.*, p. 358.

tion to the muscles may, and constantly does, take place without the subject being at all aware of it. Thus in thought-reading the place where an object has been hidden is revealed to the thought-reader by slight muscular pressures and twitches unconsciously produced by his guide, who all the time concentrates his attention on the idea of the hidden object and the place where it is to be found.

On the whole, at the level of our present mental development, ideational trains of thought proceed for the most part without any distinct and conspicuous embodiment in actual movement, unless a need arises for communicating them to others. But the conditions are very different in more primitive stages of evolution. Where free ideational activity is just struggling into independent existence, so that it may be regarded as little more than an extension or supplement of perceptual activity, ideas can scarcely fail to pass into overt movements. The more life in general is a life of bodily activity, the more likely is bodily activity to enter into ideal process. Besides this, we must remember that the less developed and habitual are trains of thought, the more difficult they are to sustain; so that whatever means offer themselves for the furtherance and support of the process will be utilised. But the partial repetition of the ideally represented object by means of actual movements yields a ready and effective means of fixing attention on the object. Hence we may regard the actual expression of ideas by movements as primary, and the absence of such expression as the result of a comparatively high degree of mental development.[1]

[1] "I fancy the main body of the lower classes of Africa think externally instead of internally . . . even when you are sitting alone in the forest you will hear a man or woman coming down the narrow bush path chattering away with such energy and expression

But even if we suppose that the tendency to act out an idea does not find distinct realisation in the individual's own private trains of thought, it must do so when occasion arises to communicate with others. Suppose that *A* and *B* are co-operating in some important work. It is *B*'s turn to do something, and *A*'s to wait expectantly. *B* either fails to do what is required of him or does it wrongly. Suppose that *A* has no conventional language to express himself in, or even that he has not used language of any sort until that moment. If he is capable of ideally representing what he wants *B* to do, he can scarcely fail in his impatient eagerness to make movements indicating what is required. It may be sufficient to point to some object actually present. This does not, strictly speaking, involve the use of language. But if he uses a truly imitative gesture or combination of imitative gestures, then his action is the birth of language. He may, for instance, point to a rope and imitate the act of hauling. The imitation of the act of hauling is simply his own idea of hauling issuing in actual movement. Thus from a psychological point of view the most primitive form of language is the imitative gesture. We shall now proceed to give evidence in favour of this position.

§ 4. **Natural Signs.**—Some writers appear to assume that all language worthy of the name must consist of conventional signs. Such a view creates unnecessary difficulties. The essential function of language as a means of conceptual analysis and synthesis may be fulfilled by a system of natural signs such as uninstructed deaf-mutes employ and largely devise for themselves. A natural sign bears in its own nature a resemblance to the thing

that you can hardly believe your eyes when you learn from them that he has no companion." M. H. Kingsley, *West African Studies.*

signified, to the mode of using or producing it, or at least to some action, state, or adjunct characteristic of it. Merely demonstrative gestures which stand alone and not as part of a context, expressed or understood, are not to be counted as part of the language of natural signs. It is true that they are signs and that they are natural. But they are not language in the only sense which is relevant; for they are not means of conceptual analysis and synthesis. They consist in acts drawing attention to an object actually present or to be found in a certain direction. But if the object, thus indicated, is pointed to, not for its own sake, but merely as a sign of some absent object which it happens to resemble or with which it has some kind of natural connexion, the gesture is a true expression of ideas and therefore belongs to language in the strict sense. Demonstrative signs also become part of language when they belong to a context. Thus if a man imitates an action and then points to another man, the act of pointing is a sign of gesture-language. For it does not merely draw attention to the man as he presents himself at the moment; on the contrary the presence of the man at the moment is only used as a means of representing something else; it is used as a means of representing the man as performing an action which at the moment he is not performing. Similarly, the direct expression of emotion cannot be regarded as language. But it is otherwise when the expression of a special emotion is imitated, so as to convey the *idea* of the emotion. Thus if *A* noticing *B* preparing to act in a certain way points to *C* and frowns, this is true language. For *A*'s act is not a direct expression of his own emotion, but only a way of conveying to *B* his idea that *C* will be angry if *B* does not alter his conduct. So, too, the imitation of a characteristic sound made by some animal or thing is not in

itself language; it only becomes so when the mimicry is meant to convey the idea of the thing or animal which makes the sound.

Earlier writers on the origin of language were much perplexed by the difficulty of explaining how a convention as to the meaning of words could be established between the different members of a community who were not already in possession of a means of communicating their ideas. This difficulty has been frequently used as an argument for referring the origin of language to a divine revelation. But it disappears if we suppose the natural expression of ideas to be prior to the use of arbitrary signs.

Positive evidence for the primitive nature of natural signs may be drawn from the case of deaf-mutes and savages. A deaf-mute called Kruse, a highly educated man and a distinguished teacher, has left on record an account of the spontaneous origin of natural language in the minds of those who cannot command conventional signs. He says: "What strikes" the deaf-mute "most, or what makes a distinction to him between one thing and another,—such distinctive signs of objects are at once signs by which he knows these objects, and knows them again; they become tokens of things. And while he elaborates the signs he has found for single objects, that is, while he describes their forms for himself in the air, or imitates them in thought with hands, fingers, and gestures, he develops for himself suitable signs to represent ideas, which serve him as a means of fixing ideas of different kinds in his mind and recalling them to his memory. And thus he makes himself a language, the so-called gesture-language; and with the few scanty and imperfect signs, a way for thought is already broken, and with his thought as it now opens out, the language cultivates and forms itself further

and further."[1] According to Schmalz, the more intelligent deaf-mutes form natural signs spontaneously, if they are not altogether neglected by their fellow-men. At first they point to the objects in which they are interested, in order to indicate their wishes. If the objects are not in sight they fetch them or conduct others to them. The deaf-mute points to a dish or a jug and so indicates his desire for what the dish or jug contains. "If he wants bread he brings the whole loaf, together with a knife, and he hands both to the person who is to cut a slice for him." There is not much to distinguish such signs from the demonstrative gestures an intelligent monkey or even a cat may employ. But cases occur in which devices of the kind described are inadequate. "The deaf-mute, it may be, wants a drink of water; he sees neither water nor drinking-glass in the room, so that he cannot point to the one or fetch the other. He takes someone by the hand in order to lead him to the place where the water is. The person to whom the appeal is made refuses to move. The deaf-mute is perplexed and embarrassed. Finally he adopts the device of pointing to his mouth." This is something more than a practical expedient. It is the expression of an explicit idea. But the sign is ambiguous. The person addressed may, through a real or pretended misunderstanding, give the deaf-mute something to eat instead of something to drink. He is thus driven to define his meaning by a combination of gestures—a context of natural signs. He directs his hand towards his mouth again, but now he curves it as if it held a glass, at the same time imitating the act of drinking. "At last he makes himself understood," and "from this time forward, he learns to describe absent objects, and he forms for

[1] Quoted by Tylor, *Early History of Mankind.*

himself a language of natural signs, at once betokening and producing a distinctively human power of thought."[1]

In a certain degree what has been said of deaf-mutes applies also to ordinary children. "A child's gestures are intelligent long before it has any extensive command of intelligent speech, although very early and persistent attempts are made to instruct it in the use of words, and no such attempts are made to instruct it in the use of gestures."[2] "Missionaries, explorers, and shipwrecked mariners acquire the language of savage races through the medium of natural signs. They point to objects and make gesticulations, at the same time observing what articulate sounds are associated with these motions by the persons addressed."[3] Whenever a person is at a loss to express himself by means of words he naturally has recourse to gestures if the subject-matter admits of it. "Without having ever before seen or made one of the signs used by Indians or deaf-mutes, he will soon not only catch the meaning of theirs but produce his own, which they will likewise comprehend."[4] The primitive character of gesture-language is indicated by its widespread use among savages. This is partly due to the inadequacy of the signs of their conventional language, and partly to the diversities of speech which make the spoken words of neighbouring tribes unintelligible to each other. Travellers have reported the existence of tribes whose oral language is inadequate even for ordinary intercourse. Their evidence has been called in doubt, but apparently without sufficient reason. It is well established that the Bubis of the island of Fernando Po cannot understand each other in the dark.

[1] *Ueber die Taubstummen*, pp. 267 *seq.*

[2] Col. Mallery in the Annual Report of the Bureau of Ethnology of the Smithsonian Institute, vol. i., p. 276.

[3] *Ibid.* [4] *Ibid.*

Miss Kingsley in her *Travels in West Africa* tells us that among the Fans it is common to propose to go to the fire in order to see what people are saying. But the second reason we have assigned is probably the more important. The fullest development of natural signs is found among the North American Indians, where the diversities of conventional languages within a limited area are very numerous.

The free and copious use of imitative gestures is almost universal all over North America, and it is also very widely spread in South America. It must not be supposed that the same signs are everywhere in common use. This is far from being the case. There is no common code. A common code is only possible by convention. It must be fixed by usage. But the vast distance which separates different tribes does not permit of this arbitrary uniformity arising from custom. An imitative gesture delineates the most striking outlines of an object or the most characteristic features of an action. But different individuals and different social groups do not always agree in the selection of these outlines and features. A deer, for instance, may be designated "by various modes of expressing fleetness, by his gait when not in rapid motion, by the shape of his horns, and sometimes by combinations of several of these characteristics."[1] Besides this, when a sign has become fixed by usage it may become modified and abbreviated in various ways, as conventional understanding takes the place of self-interpreting pantomime. It might therefore be expected that Indians using one dialect of natural signs would not understand other Indians, using a diverse dialect. It would appear still less probable that an Indian should on

[1] Col. Mallery, *op. cit.*

the first encounter understand a deaf-mute or *vice versâ*. But in fact it is found that in spite of the diversity of signs mutual understanding is possible to some extent between all who have any expertness in the use of imitative gestures. However special signs may vary, the formative principle remains the same, and this formative principle adapts itself in the most flexible way to varying conditions. A man may understand at once a gesture which he has never seen before. If any one of the more conventional signs is not comprehended, an Indian skilled in the art of imitative suggestion tries new ways of conveying his meaning. It is often sufficient to reproduce in full pantomimic detail a gesture which had first been given in an abbreviated form. If this expedient fail, it is always easy to try other modes of representation. In one way or another experts in sign-language manage to interchange ideas in the form of long dialogues and narrative without any prior convention. Of course it is assumed that there is a basis for mutual understanding in community of interest and experience.

§ 5. **Natural Signs as Instruments of Conceptual Thinking.**—Expression by natural signs fulfils the essential function of language as a means of conceptual analysis and synthesis; by it the content of concrete experience is resolved into relatively elementary and general constituents which are freely recombined in new ideal structures. That the signs of gesture-language bring with them an apprehension of the general or universal aspects as distinct from the particular and specific details of perceptual experience is plain from their very nature. An imitative gesture can only suggest general characters or features common to a class of objects or actions. The thought it expresses or evokes is only a fragment of a thought and demands completion. It is indeterminate and requires further definition

from a context expressed or understood. The context itself consists of other imitative gestures, each expressing a relatively indeterminate universal. Each of these relatively indeterminate universals particularises and defines the others, and is by them particularised and defined. Just as we can illustrate this process by taking at random any intelligible combination of conventional words, so we can illustrate it by taking at random any intelligible combination of imitative gestures. The analogy holds good in another respect also. The natural sign, like the conventional word, becomes modified in meaning in varying contexts and under varying circumstances.

We may illustrate both points simultaneously. An acquaintance of Colonel Mallery's once asked the same favour of two chiefs successively. Each in replying used the common sign for repletion after eating—"viz. the index and thumb turned towards the body, passed up from the abdomen to the throat; but in the one case being made with a gentle motion and pleasant look, it meant 'I am satisfied,' and granted the request; in the other, made violently, with the accompaniment of a truculent frown, it read, 'I have had enough of that.'" Here the sign used for bodily repletion derives a metaphorical meaning from the context in both cases, and a different meaning in each.

§6. **Conventional Element in Gesture-Language.**—The theory that natural signs are psychologically the most primitive form of language has two advantages. The first of these is, that self-interpreting signs arise naturally and spontaneously wherever there is any need for them. The second is, that they rapidly tend to become more or less conventional between members of the same community so as to pave the way for a system of purely arbitrary signs. The imitative gesture tends to become more or less conventional inasmuch as the understanding of it comes to

depend, not merely on its own intrinsic value as a self-interpreting sign, but also on its having been employed and understood before. On a first occasion, the sign may occur in circumstances or in a context which leave no doubt as to the meaning; on a subsequent occasion these circumstances or this special context may be absent, so that if the sign were then made for the first time, it would not be understood; nevertheless it may be understood on the second occasion just because it had been understood on the first occasion. "The deaf and dumb teacher in the Berlin institute was named among the children by the action of cutting off the left arm with the edge of the right hand; the reason of this sign was not that there was anything peculiar about his arms, but that he came from Spandau, and it so happened that one of the children had been at Spandau and had seen there a man with one arm."[1] It is evident that this sign might come to be understood and used by members of the institution who knew nothing of its derivation.

One highly important way in which natural signs tend to become relatively conventional is through abbreviation. There is a strong disposition to abbreviate familiar gestures. The mere hint of a movement comes to be substituted for the movement itself. Colonel Mallery observed a Cheyenne Indian attempting to convey the idea of *old-man*. "He held his right hand forward bent at elbow, fingers and thumbs closed sidewise. This not conveying any sense, he found a long stick, bent his back, and supported his frame in a tottering step by the stick held as was before only imagined.[2]

By processes of this kind, those who employ gesture-

[1] Tylor, *Early History of Mankind.*

[2] Annual Report of Bureau of Ethnology, vol. i., *loc. cit.*

language must become familiar with the possibility of a conventional arrangement for the expression of ideas. But the natural system never actually passes in this manner into a conventional system. Its formative principle remains all through essentially that of imitative representation. The deaf-mute and the Indian rarely lose sight altogether of the natural connexion between sign and signification. A bystander may be totally unable to detect the meaning of the signs used in conversation, owing to abridgment of natural pantomime. But the deaf-mute, or the savage, is able if required to act out in detail his abbreviated gesture. Natural signs may lead up to a conventional language, but they do not develop into one.

§ 7. **Origin of Conventional Language.**—The language of natural signs is pervaded by the systematic unity of a single formative principle—that of imitation. This gives it so strong and tenacious a hold upon the mind that it can only be displaced by a conventional language which has also a systematic unity of plan. It can never be displaced by a chaotic multiplicity of detached and disconnected signs, each of which has to be separately remembered by an independent mental effort. The human mind could not endure so burdensome a load. The conventional signs which are to displace imitative gestures must therefore form some kind of system, unified by general formative principles. Now visible gestures are theoretically and practically capable of forming a conventional system. The deaf-mute is sometimes taught a finger-language which is purely conventional. He makes a limited number of easily remembered manual signs, each corresponding to a letter of the alphabet, and by successively combining these he spells out words and sentences. Such a language has a unity of composition which makes it manageable. There is in it a possibility of systematic correspondence between expres-

sion and meaning. Where meaning is partially similar, expression may be partially similar; where meaning is modified, expression may be modified in a corresponding manner and degree. But the important point is that the systematic unity of composition belongs in the first instance to articulate speech. The manual alphabet is merely a translation of the oral alphabet. Further, it could only have been devised after articulate utterance had been already analysed into its elementary constituents. Now a conventional system of manual or other visible movements analogous to the conventional finger-alphabet could not grow up spontaneously out of a previous system of imitative gestures. We might as well expect an untutored savage to invent the steam-engine or the electric light. A limited and easily manageable set of manual signs is required. But on what principle are the signs to be selected, and on what principle are they to be limited? Oral language had been in use for long ages before its alphabet was discovered. But the invention of a similar system of visible signs would have been incomparably harder than the discovery of the alphabet. The discovery of the alphabet was the discovery of unity of composition in a structure already existing and familiar to mankind. But the independent invention of a visible alphabet would have been not a discovery arising through reflective scrutiny of familiar experience, but a highly artificial creation.

On the other hand, articulate utterance is, as a natural process, characterised by unity of composition. This unity of composition is determined by the structure of the organs of speech. There is no need to invent an alphabet before combining elementary sounds in syllables and words. The alphabetical sounds which form the vital constituents of all speech were, as Ferrier says, "there from the be-

ginning." Undetected, but yet present and operative, they made possible a systematic correspondence between meaning and expression. This correspondence is not indeed of the same kind as that which characterises the imitative gesture. Any isolated imitative gesture has a direct affinity with the thing it represents. The absence of this direct self-interpreting affinity is just what distinguishes the conventional from the natural sign. None the less, systematic correspondence is possible where there is no direct resemblance. The rise and fall of the mercury in the thermometer corresponds to the rise and fall of temperature, but it does not resemble it. So, apart from all similarity between sounds and what they signify, there may be a correspondence between the relations of sounds and relations of meaning. Where meaning is partially similar, its utterance may be partially similar; where meaning varies more or less in this or that special manner, expression may vary more or less in a corresponding manner.[1] This we find to be the case in all known languages.

It is here that philological analysis becomes important. In all languages there are traceable certain comparatively elementary phonetic components called roots, expressing primary universals or products of conceptual analysis; and these roots variously modified and entering into various combinations express conceptual synthesis or discursive thinking. They blend and combine in continuous speech just as the corresponding concepts blend and combine in continuous thought. This is possible because of the ultimate unity of composition of the phonetic material, which is resolvable into elementary alphabetic sounds which do not occur in isolation but as parts of an articulate complex.

[1] Consider, for instance, the connexion of blot, blotter, blotting, and blotting paper, and of write, writer, writing, and writing paper.

§ 8. Certain other Theories of the Origin of Speech.— Attempts have been made to explain the origin of language without emphasising the importance of the visible gesture as the starting-point. There are three main theories of this kind, which have been nicknamed by Max Müller the *pooh-pooh* theory, the *bow-wow* theory, and the *ding-dong* theory. Their more pretentious titles are the *Interjectional*, the *Onomatopœic*, and the *Pathognomic* theories. The principle involved in all these theories is essentially the same. They all attempt to trace back conventional signs to natural signs; but they exclude from consideration visible gestures, and confine attention only to vocal signs. It is evident that to mimic the mewing of a cat, in order to convey the idea of that animal, is as much an imitative gesture as going on all fours and humping the back for the same purpose. It is mimicry of this kind on which the *bow-wow* theory relies for explanation. The same holds good of imitating the cry of fear, in order either to convey the idea of the emotion or of the approach of a dangerous object. This is the sort of expressive sign which is most primitive according to the *pooh-pooh* theory.

The *ding-dong* theory is more subtle, and it has the distinction of having been advocated by Professor Steinthal. According to it, specific kinds of objects so affected primitive man as to elicit from him, or to use Max Müller's metaphor, to *ring out* of him, correspondingly specific utterances. The most primitive words would therefore be phonetic types *rung out* from the organism of the first man or men when struck with an idea. There is a harmony of sound and sense which does not depend on the imitation of one sound by another. The charm of literary style and especially of poetry consists largely in the subtle affinity between vocal expression

and the objects or activities expressed, which may exist apart from any resemblance of sounds to one another. The word *zigzag* is a good illustration. The *zig* goes this way, and the *zag* goes that way, the tongue itself describing a *zigzag* course. What philologists call reduplication has often this intrinsic expressiveness, *e.g.* a "big big man"; a "wide wide sea"; "far far away.' Among the Botocudos of Brazil *ouatou* stands for stream. *ouatou-ou-ou-ou* is the sea.

In this metaphorical expressiveness of vocal utterance we may detect under a somewhat deceptive disguise the essential principle of the imitative gesture. Even the disguise is not present in the case of reduplication; here more of the same kind of sound represents more of the same kind of thing. Other instances may look more mysterious. But the mystery to a large extent disappears when we consider that articulate speech consists not merely in articulate sounds, but also and as well in the motor process of articulation. The tongue actually does go zigzag in uttering the word *zigzag*. *Tick-tack* imitates not only the sounds of the clock, but the rhythmic movement of the pendulum by a corresponding movement of the tongue. Even born deaf-mutes use the organs of articulation in this imitative way. Heinicke, as quoted by Tylor, mentions a "deaf-mute, nineteen years old, who had invented many writeable words for things." Some of these were arbitrary; but at least two, *mumm* for eating, and *schupt* for drinking, were, as Tylor remarks, an imitation of the movements of the mouth in eating and drinking. In like manner *njan* means to eat in the Negro-English dialect of Surinan, and *njan njan* means food.[1] Thus

[1] Tylor, *Early History of Mankind*, p. 73.

the *ding-dong* theory is in its more obvious applications reducible to the general principle of the imitative gesture. That part of it which is not so reducible is of little value as an explanation of the origin of language. Vague and recondite affinities between sound and sense cannot in the first instance constitute a natural and spontaneous language, because they are not sufficient to make the vocal utterance self-significant or self-interpreting. For this it is not enough that a word should be dimly felt to be appropriate when its application is already known. It is necessary that the sign should be so stamped with the character of the thing signified as to determine its application in a given context and under given circumstances. On the other hand, it must be admitted that when once the meaning of a word has become a matter of convention a general feeling of affinity between sound and sense may operate powerfully in determining the creation and selection of new words.

These and similar theories must all be regarded as part of the general doctrine that natural signs psychologically precede conventional signs. They are true and useful inasmuch as they emphasise the part played by phonetic elements in imitative expression. The imitative use of vocal utterance paves the way for the development of conventional speech. Why conventional language has come to consist almost entirely of phonetic elements we have attempted to explain in the last section. The reason why natural signs have to so large an extent been displaced by conventional signs lies in their superior convenience and power.

§ 9. **Advantages of Conventional Language.**—The primary and essential procedure of the language of natural signs is to represent things and processes by imitating the broad features of their sensible appearance

and especially of their appearance to the eye. But the characters which are capable of being so imitated are of a comparatively low grade of generality or abstractness. They represent an analysis of perceptual experience into universals and its reconstruction out of these universals. But the universals themselves are very far from being simple and ultimate. They in their turn are intrinsically susceptible of analysis, and constituents thus revealed are again susceptible of further analysis, and so on. Now the more advanced is this process of dissection, the more helpless is pictorial representation to express the result either within the individual consciousness or in the intercourse of different minds. Hence a mind whose discursive thinking could only find expressson in self-interpreting signs, would be incapable of the higher reaches of abstraction. Broadly speaking, natural signs are capable of fixing attention on universals which are constitutive characters of particular objects as presented in perceptual experience; but they can only to a very limited extent fix attention on universals which are constitutive characters of other universals. The thinking which depends on the imitative gesture generates concepts; but it can hardly generate a conceptual system, in which there is an ascending scale of generalisation, passing from species to genus, and from genus to higher genus, and so on through a series of gradations till the highest genus is reached. It seems beyond the unaided powers of the thought which works through natural signs to frame a system of classification.

This impotence of the imitative gesture to express higher universals is easily illustrated. "To make," says Tylor, "is too abstract an idea for the deaf-mute; to show that the tailor makes the coat, or that the carpenter makes the

table, he would represent the tailor sewing the coat, and the carpenter sawing and planing the table."[1] According to Schmalz, "The more general determinations of magnitude such as *broad, narrow*; *long, short*; *thick, thin*; *high, low*; cannot be accurately expressed; the most that can be done is to teach the deaf-mute signs which are suitable to the largest proportion of cases."[2] Often a general concept is capable of pictorial expression; but only in a way which is cumbrous and circuitous when compared with the conventional. A series of imitative gestures may be needed, where a single word would effect the same purpose with greater precision and certainty. Thus an Indian who wished to convey to a deaf-mute that he had travelled in the train, could only convey the idea of *train* by three successive bits of pantomime, one representing the conception of something covered in, another that of wheels, and the third that of smoke. Now this mode of expression may at first sight appear more analytic than the use of the single word *train*. It resolves into three universals and reconstructs out of them what the conventional language expresses in its totality by one sign. But we must remember that we could use many signs if there were need for them. If there were occasion to give an analytic description of a railway train, that description could be given with far more fineness, precision, and adequacy in words than in imitative gestures. The conventional language uses one word because one word is enough. The language of imitative gesture uses three separate bits of pantomime because it cannot do with less. It is forced to describe because it cannot directly designate. Now why is it unable to express by a single appropriate sign the general conception of a

[1] *Early History of Mankind.*
[2] *Ueber die Taubstummen*, p. 275.

railway train? The reason is that the concept of a railway train possesses too high a degree of universality. It gathers up into unity a great multiplicity of special features, functions, and relations. Among these are included some which it would be difficult to express concisely, or even to express at all, in the gesture language, as for instance the principle or mechanism of its locomotion, its function as a means of communication and traffic, and so on. Now the comprehensive unity which embraces within itself all these particular determinations is not capable of being directly expressed in natural signs, without the aid of convention. Hence in a communication by imitative gestures, where there has been no previous convention, the only course possible is to select certain particular characteristics of the object, which are at once important and easily presented to the eye, and to exhibit as many of them as appear sufficient to enable the intended meaning to be divined. The same deficiency also makes it difficult to refer to an individual person by a self-expressive sign. The imitative gesture as such and apart from convention is incapable of directly expressing the universality which belongs to the individual and is associated with the Proper Name. The depiction of some special characteristic or peculiarity may or may not be successful in directing attention to the person intended. All depends on context and circumstances. If representation of this or that characteristic proves insufficient, others may be added until understanding is reached, as in the case of the railway train.

CHAPTER VI.

THE EXTERNAL WORLD AS IDEAL CONSTRUCTION.

§ 1. **Unification of Perceptual Data.**—It is the function of free trains of ideas to connect in a continuous whole the detached data of sense-perception occurring in the course of individual experience. The isolated facts of sense-perception are made continuous with each other by interposing between them ideally represented links. The perceived thing reveals itself in actual perception as existing, persisting and changing independently of the motor activity of the percipient. Its characteristic nature as externally real object essentially involves this independence of the percipient subject and his changing position in relation to it. But the percipient may not only alter his relative position in regard to it, while he is actually perceiving it; he may also turn aside from it altogether, or remove himself to such a distance that it can no longer affect his senses. As change of position on his part makes no difference to the thing as physical object, so his presence or absence can make no difference to its nature and existence. When therefore he ideally represents it, he will represent it as existing, persisting, and changing, although it is no longer perceived. He will represent it as existing, persisting, and changing in the same manner as if he were in its presence and actually observing it. Herein lies the possibility of extending knowledge of material things and processes far beyond the limits of actual perception so as

to construct an ideally represented world of which only detached fragments are actually perceived.

We have now to assign the motives which prompt and guide the process of ideal construction. The first of these is that which constitutes the impulse to all theoretical as distinguished from practical thinking. It is the endeavour to clear experience from incoherence, contradiction, and ambiguity. Incoherence, contradiction, and ambiguity obstruct the onward flow of ideas. Where they rise, therefore, the course of mental activity will direct itself to their removal. Now it is obvious that conflict must continually arise between an object as actually perceived and the same object as ideally represented on the basis of previous perception. A man leaves an object at rest in one place: he returns and finds it in another place: the discrepancy can only be removed by ideally connecting the two experiences by intermediate links representing some mode in which the transference from one place to another may or must have taken place. A fire is left burning brightly; after an interval nothing is found but grey embers. Percept and remembrance must be connected by ideal representation of a fire gradually decaying. Again, the fire which is left burning brightly may after a long interval of time be found still burning as brightly as ever. Here the representation of the fire as gradually decaying collides with the actual percept. It has not gone out. The incoherence may be removed by representing some-one as having intervened in the meantime to keep it alive. Apart from actual conflict between idea and perception, the mere strangeness of an object acts as a theoretical motive for ideal construction. The mere inability to fit it into the general scheme of things impels the subject to trains of thought directed to overcome the difficulty.

Merely theoretical interest however is on the whole a

factor of secondary importance; and the more primitive the stage of mental development attained, the less important it is. The systematic pursuit of knowledge for its own sake is a late outcome of mental evolution. In early stages of human development thinking is mainly subservient to practical ends, and its impelling motive lies in the pressure of practical needs. Thus the process of ideal interpretation is carried on only so far as it supplies a guide to action. Merely theoretical speculation may and does exist as a sort of amusement: but it is not followed out in a serious and strenuous manner.

§ 2. **Verification and Re-interpretation.**—The primary function of ideal construction is the framing of means for the attainment of practical ends. The ideal combinations which thus arise are of use only in so far as they are translated into action. The plan which is formed in the head must be put into execution. Now the course of events which takes place in the execution of the plan may or may not conform to the ideal pre-arrangement. When it does so conform, the ideal pre-arrangement is verified by the result. When events fall out otherwise than was anticipated, the ideal pre-arrangement is contradicted by the result. In case of failure, there is a new impulse to thought. The ideal combinations must be modified until an effective plan is reached. In this way, the process of ideal construction is perpetually finding and utilising new data. In the original ideal train, there may be a sequence *a, b, c, d*, but the actual sequence of events when the plan is carried into execution may be *a, b, c, q*. This provokes a new process of ideal construction, in which the represented order is *a, b, c, m, d*. On trial, this ideally represented sequence is verified. On subsequent occasions, when the practical end is similar, the sequence *c, m, d* will be substituted for the sequence *c, d*, where other relevant

conditions are similar. Thus ideal construction subserves practical activity, and in its turn practical activity yields fresh material for ideal construction. It may happen of course that a plan of action sometimes succeeds and sometimes fails, owing to conditions beyond the agent's control and possibly beyond his power to foresee. When this is the case, effective reconstruction of his ideal scheme is not possible, and he must take his chance of success or failure in each particular instance. Again, it may happen that the result depends upon conditions entirely outside the range of his experience, so that his action is quite inefficient. Under such circumstances there will be no cessation of the activity of ideal combination or practical execution, if the interests involved are sufficiently strong. We have an instance of this in modern times in the widespread use of quack medicines. The patient is really helpless, but he tries every means that suggests itself. In more primitive stages of mental development, whole systems of ideas arise in this way, which we from our superior point of view stigmatise as mythology or superstition.

Real insight into physical nature, and effective control over its processes, are acquired in the first instance mainly by mechanical contrivance and mechanical execution. Weaving, basket-work, pottery, building, the construction of tools and weapons, yield in early stages of development a real knowledge of the nature of physical things and a real control over them. In such mechanical operations, ideal analysis and synthesis are accurately translated into real analysis and synthesis, a real separation and re-combination of the parts of matter. Thus the constitution of the physical world is learnt by actually taking it to pieces and putting it together again. In general, insight into natural process is in proportion to the degree of development of the mechanical arts.

The knowledge of nature which is embodied in modern science is essentially of the same type. There is however one important difference. We now artificially separate and re-combine physical conditions for the sake of obtaining knowledge, and not merely for practical purposes. Experiments are now made with a purely theoretical interest, because the love of knowledge for its own sake has become strongly developed.

§ 3. **Space as Ideal Construction.**—We are unable to perceive, imagine or draw on paper, any actual line, which can be ascertained to be perfectly straight. None the less, we know clearly what is meant by a perfectly straight line. This is possible, because in ideal construction we can by mental abstraction regard as irrelevant the physical conditions which actually prevent perfect straightness. A drunken man tries to walk straight along a road; but in spite of his efforts his course is more or less conspicuously zigzag. In his own mind, the course he intends to pursue is contrasted with the course he is compelled to pursue against his will. The course he intends to pursue is that which he would pursue apart from certain interfering conditions. It is thus an ideal construction presupposing conceptual analysis. Now it is possible in this way to disregard and treat as irrelevant all properly physical conditions as contrasted with those conditions which are contained in the very nature of space, as such. A line, as straight as the nature of space will admit of apart from other interfering conditions, appears to ideal construction as a perfectly straight line. In a similar way the conception of a perfect circle and other perfect figures arises. It is possible to notice degrees of roundness before attaining the explicit concept of a perfect sphere or circle, just as we notice different degrees of bigness, although there neither is nor can be an ideal of perfect

bigness. Having had experience of *b*, which is rounder than *a*, we may try to make *c*, which will differ from *b* in degree of roundness as *b* differs from *a*. The obstacles which hinder us in such an attempt are our own deficient skill or the nature of the material we have to deal with. If we abstract from such conditions and consider only the nature of space, we have a concept of perfect roundness. The starting-point of this development is probably to be found in the attempt to make things as round, as straight, or as square as possible in the process of mechanical construction. In this way there will come to be an ideal roundness, or straightness, or squareness, and these ideals, at first rude, will ultimately pass into the abstract mathematical conceptions with which Euclid has made us familiar.

The conception of the infinity of space has a like origin. Progress from place to place may be arrested by all kinds of physical conditions; but if these be disregarded, and the nature of space alone considered, no reason is discernible why movement from one position to another should have any limit. A spatial limit is the boundary line between one part of space and an adjoining part; it is a limit *in* space, and cannot therefore be a limit *of* space. It is by mental process of the kind described that the transition is made from space as perceived or imaged to space as conceived.

§ 4. **Time as Ideal Construction.**—The process of ideal construction makes a greater difference in the case of time than even in that of space. We have seen how in an ideally represented time-series the distinction between *now* and *then*, or between one *now* and another, becomes relative, so that according to the point of view we may regard any part of the series as a *now*, and what precedes or follows as relatively future or past. But besides this

relative antecedence and subsequence, there is also what we may call an absolute *now*—the moment determined by the immediacy of immediate experience. This forms a starting-point for ideal construction of time-order. What is prior to it is regarded not merely as relatively but as absolutely past; what is subsequent to it is regarded not merely as relatively but as absolutely future Past and future are still defined only by their relations; but the starting-point from which we define them is not arbitrary but fixed, and fixed not by ideal construction but by actual sensation and feeling. As Dr. Ward says:—"To a being whose presentations never passed through the transitions which ours undergo—first divested of the strength and vividness of impressions, again re-invested with them and brought back from the faint world of ideas—the sharp contrasts of 'now' and 'then,' and all the manifold emotions they occasion, would be quite unknown. . . . In the obligation to wait and work in hope or dread of what is 'still to come' there is much more than time-order."[1] The apprehension of past and future in this absolute sense pre-supposes a starting-point in the immediate experience of the moment; and an ideal construction in two directions,—on the one hand, of what has preceded, on the other, of what is to follow the actual *now*. On the whole, anticipation of the future must be regarded as prior in the order of development to reminiscence of the past. For the primary stimulus to ideational activity comes from practical needs; and these are in the first instance concerned with the future. Given a present urgency in the way of hunger or thirst, the primary demand made upon ideational activity is for the devising of means to procure food or drink. It is thus called on to

[1] Article "Psychology," *Encyclopaedia Britannica*, p. 576.

follow out a train of ideas representing the successive links connecting the present state of need with a future state of satisfaction. Trains of ideas representing previous sequences of events will at first be called into play mainly by the need for data derived from the past to use in providing for the future. But the grand stimulus to reminiscence is not to be found in dealings with the physical world, but in the personal and social interests which we shall have to discuss under the head of Self-Consciousness. There are two characteristics which distinguish the future from the past apart from abstract priority and subsequence. The future is uncertain, or in other words, its anticipation may take the form, not of one definitely fixed series of ideal representations, but of a number of alternative lines, which compete with each other for predominance in consciousness. But the past has already taken determinate form; in it one definite alternative has already been realised to the exclusion of others. Besides this, past and future have an altogether different relation to practical activity. The future is something which may be in a greater or less degree determined by the agency of the subject himself; and he must be continually adjusting his actions so as to modify it, if he is to survive and live a tolerable life in the world. But the past is beyond this kind of control. Retrospection can only be of use in supplying data for pre-arranging the future.

So far we have considered only the lapse of time as it appears to the individual subject, or in other words what is sometimes called subjective time. But it is plain that this does not coincide with time as measured by the clock. Shakespeare tells us that time travels "in divers paces with divers persons"; Newton tells us that time moves at a constant rate. Shakespeare's time is evidently subjective time, and Newton's objective time. In a position

of great difficulty and danger minutes may appear like hours. Two lovers in the enjoyment of a lovers' conversation may find hours pass like minutes. The subjective estimate of time is more or less different from time as measured by the clock, though normally there is a rough correspondence between them. Objective time as distinguished from subjective is a product of ideal construction. The beginning of the process by which it comes to be conceived is found in the conditions of practical activity. Lapse of time is often an important factor in the attainment of practical ends. It takes a certain time, for instance, to travel from one given place to another, or to cook a piece of meat, or for water to boil, or for clay to harden in the sun. Now in practical calculations it will not do to leave the estimate of the lapse of time in such cases to the varying impressions of the individual. The only effective mode of procedure is to find some other process which coincides in its beginning and termination with the process of which the duration is to be measured. Thus, if the question be, how long it tkaes to get from one place to another, a sufficient answer may be found by reference to the course of the sun. It will take perhaps from sunrise to sunset of a summer's day; or from sunrise till noon. The efficiency of this mode of procedure depends upon the discovery of uniform standards of measurement. These are best supplied by rhythmic processes which repeat themselves at intervals. If it is found that the duration of events in general can for practical purposes be defined by saying that they take the same time as one or more repetitions of a certain rhythmic process, this process has proved its efficiency as a standard of measurement. The process which we now most commonly use is the movement of the hands of a clock. The movement of the minute-hand, starting from one position

and returning to it again, constitutes a fixed period which we call an hour. So the movement over a smaller interval on the dial constitutes another fixed period which we call a minute. Objective time is thus an ideal construction, and the principle on which it rests is that processes otherwise similar, and taking place under similar conditions, will occupy the same time. Thus if they start simultaneously, they will terminate simultaneously, and so on. Similarly, if two dissimilar processes are found to occupy the same time on one occasion, they will occupy the same time on another occasion, under like conditions.

§5. **Causality as Ideal Construction.**—On the purely perceptual level, there is a tendency to repeat modes of procedure which have proved successful in the past, and to discontinue modes of procedure which have proved unsuccessful. To this extent the category of causality operates in perceptual consciousness. But for the merely perceptual consciousness the question why a given cause produces a given effect can hardly be said to exist. Ideal construction is continually asking this question. It is the very essence of the process by which means are devised for the attainment of practical ends to interpose between the starting-point and its termination a series of ideally represented links, each constituting an indispensable term in a train of causes leading up to the ultimate effect. These practical experiences yield material for interpreting events which take place apart from the agency of the subject. Thus it becomes possible to ask why *A* produces *D*, and to answer by saying that *A* produces *B*, and that *B* produces *C*, and that *C* produces *D*. So far as this ideal construction is determined by more or less practical experiences such as those connected with mechanical contrivance, it yields a true insight into the nature of physical process. But strong interests of a practical or theoretical

kind often create a need for explanation where data for explanation are either altogether insufficient or absent. In such cases the ideal construction will take a form which appears from a higher point of view fanciful and absurd. Why has the robin a red breast? Because cock-sparrow shot it with his bow and arrow. A good example of a simple causal series of this kind is the story of the old woman whose pig would not go over the stile. "As soon as the cat had lapped up the milk, the cat began to kill the rat, the rat began to gnaw the rope, the rope began to hang the butcher, the butcher began to kill the ox, the ox began to drink the water, the water began to quench the fire, the fire began to burn the stick, the stick began to beat the dog, the dog began to bite the pig, the pig in a fright jumped over the stile, and so the old woman got home that night." In savage thought, there are abundant examples of causal explanation which remind us of these nursery fables.

The word *why* may have another application. In asking why a given effect is produced, the interest may lie in discovering which of a given group of conditions are essential to the result, and which irrelevant. This inquiry naturally arises when the same result follows under circumstances apparently dissimilar on the whole, or fails to appear under circumstances apparently similar on the whole. To find a cause is here to find points of identity in apparently dissimilar conditions, and of difference in apparently similar conditions. There is a West African story according to which a hunter took the first hint for weaving nets from contemplating the spider's web. His wife suggested that he might make mats and similar articles in like manner. He tried, but failed to give them shape. Accordingly, he went back to observe the procedure of the spider, so as to note the points of

difference between the animal's method and his own. He discovered that the spider started always with a fixed framework and wove its web on that. Going back to his own task, he made for himself a framework by means of sticks and poles, and so succeeded in giving proper shape to the articles he made. He had compared the two modes of procedure, so as to distinguish the points of agreement from the points of difference, and in this way was able to explain why a certain result should follow in the one case, and a different result in the other. It is by such processes of analytic comparison that universal laws of nature are ultimately discovered, which laws may form the basis of such exact and complicated mechanical contrivances as the steam-engine or the electric telegraph. In early stages of development, the distinction of the essential part of a cause from the accidental is very crude, and is in the main proportioned to the degree of advancement in the mechanical arts. Arsenic and incantations, according to Voltaire, will kill a flock of sheep. The savage rarely thinks of using the arsenic without the incantations. The medicine man accompanies even surgical operations with all kinds of ceremonials having nothing to do with the result. In Charles Lamb's dissertation on roast pig, we have a fanciful exaggeration of this feature of savage thought. Bo-bo discovers the flavour of roast pig by accidentally setting fire to a house. The custom of firing houses in order to roast pigs continued "till in process of time . . . a sage arose, like our Locke, who made a discovery that the flesh of swine, or indeed of any other animal, might be cooked (*burnt*, as they call it) without the necessity of consuming a whole house to dress it."[1] The exaggeration in Lamb's story

[1] *Essays of Elia* (Ainger's edition), p. 168.

arises from his having chosen a case in which all essential conditions fall within the practical experience and control of the agents interested in the result, so that it would be easy for them to disengage the essential from the accidental. He would scarcely have exaggerated if he had referred to such natural phenomena as disease and death, in which the operative conditions are in the main beyond the control and even beyond the ken of the uncultured mind. Here ideal construction cannot fix upon what is essential; and since the strength of the practical interests concerned demands the discovery of some operative conditions to form a basis of practical procedure, causal efficacy is ascribed to all kinds of circumstances which are in reality totally irrelevant, such as the evil eye, the malignancy of departed spirits, the magical practices of witches, and the like. On these assumptions, elaborate methods of procedure are based. Such methods are often more or less intermingled with truly curative measures, which prevent the result being wholly a matter of accident. But, on the whole, much more stress is laid on what is irrelevant and inefficient than on what is relevant and efficient. In treating a disease, it is obvious that the cure does not depend merely on drugs, or the like; for the patient may either die or recover when the same drugs are used. Other conditions are therefore imagined which by their very nature cannot come except in a partial and uncertain way within the control of the medicine man.

§ 6. **Thinghood as Ideal Construction.**—We have seen that for perceptual consciousness whatever has unity and distinctness of interest is a separate thing. Since interest is primarily practical, whatever acts as a whole, and is capable of being acted on as a whole, is one thing. We have seen that conceptual analysis resolves the unity of the thing into its constituent parts, qualities and relations,

and that conceptual synthesis re-constructs it by ideal combination of these constituent parts, qualities and relations.

Very important developments of the process of ideal construction arise out of the connexion of the category of separate *Thinghood* with that of causality These assume two forms. The first line of thought endeavours to give a causal explanation of the nature and unity of the separate thing from the connexion and interaction of its parts. The other pre-supposes the unity and intrinsic nature of the thing as ultimate and, instead of explaining them, uses them as a basis of causal explanation.

The first of these lines of thought takes its point of departure in mechanical contrivance and execution. Inasmuch as a man has himself actually put a piece of mechanism together, so that it may fulfil a certain function, he is able to explain why it fulfils this function, by showing how the parts are combined, and act on each other so as to work together in producing a certain result. The same kind of explanation may afterwards be applied to things which he cannot himself construct. He may ideally analyse and combine in a mechanical way what he cannot actually take to pieces and put together again. He may even assume constituent elements which are beyond the reach of actual perception, and by ascribing to these fixed modes of behaviour in relation to each other, he may explain the observed phenomena as the products of their interaction. Modern theories of atoms and molecules and of the motions of the particles of ether are examples of the highest development attained in this direction. Atomic theories explain the nature and mode of behaviour of perceptible things by assuming as elementary constituents of the physical world "countless atoms, invisible from their minuteness, persistent in their

duration, and unchangeable in their properties. These atoms, now coalescing in most manifold fashion, now withdrawing unaltered from these fluctuating combinations, produce by the variety of their positions and motions the different kinds of natural products and their changeful development."[1] The essential pre-supposition of such theories is that the elements which they assume as ultimate shall always behave in virtually the same way in the same circumstances. Their whole nature is supposed to be constituted by their mode of behaviour in relation to each other, and this is invariable. Explanation is more complete and satisfactory the less variety there is in the constitution of the ultimate atoms. It would be most perfect from a mechanical point of view if all natural processes could be explained by the combination and interaction of atoms in themselves homogeneous, so that the resulting variety of material products would be purely due to variety in the way in which identical elements are put together. This mechanical point of view has been applied, to a large extent with success, even to living organisms. The construction of self-acting machinery has had an important influence in suggesting this line of thought. "Our eyes," says Lotze, "cannot rest repeatedly and continuously on this remarkable borderland of self-acting instruments, which derive their material from Nature, but the form of their operation from human volition, without our whole mode of conceiving Nature being affected by these observations. . . . We know in fact that not from within, by a spontaneous effort at development, but under extraneous compulsion have the combined bodies acquired this admirable play of mutually adjusted states. Far simpler

[1] Lotze, *Microcosmus*, third edition, vol. i., pp. 31-32.

properties and effects belonged in themselves to the particular substances which we combined, varying according to universal laws with the alteration of definite conditions. These invisible forces our mechanical skill has compelled (by the cunning combinations into which it has beguiled that which holds them) to work, under such conditions that their conformity to universal laws must, without any purpose of their own, realise the ends that are our purposes."[1] Such human contrivances could not but suggest the question whether even animated organisms were not composed partly or wholly in a similar manner, having their origin in "the world's course, which combines the elements sometimes in one way, sometimes in another, and in each of these groups inexorably initiates the system of movements and operations that, according to general laws, corresponds to the actual mode of their connexion."[2] As a matter of fact, physiological explanation tends, as far as possible, to take this form.

The mechanical point of view, which has received so vast a development in modern science, sprang from extremely meagre and rudimentary beginnings in primitive thought. The power of mechanical construction and analysis implied in the making of the simple instruments of savages seems almost infinitesimal, if we compare it with our elaborate machinery. It is insufficient to suggest even the possibility of a mechanical explanation of the complex processes and products of nature, and especially of living organisms and their behaviour. Yet the mind of the savage cannot remain at rest simply ignoring the play of the natural forces which surround him and continually influence his life and activity for good and evil, but especially for evil. In particular, disease and death are pheno-

[1] *Op. cit.*, vol. ii., p. 18. [2] *Ibid.*

mena which he cannot neglect. The pressure of practical interests compels him to act and to contrive means of acting. Thus some kind of ideal construction is for him a necessity in order that he may not sit down helpless in face of a vast variety of phenomena which he cannot even think of explaining on mechanical principles. To him it is simply a familiar fact which requires no explanation, that individual things exist, having distinctive properties and modes of behaviour. It is a familiar fact that such things are composed of parts which act and are acted on together, so that change in one part is accompanied by changes in other parts. All this he does not think of explaining, but pre-supposes it without question as a basis of explanation. Hence he follows a line of thought which is opposed to the mechanical. Instead of explaining the unity of the whole by the combination and interaction of the parts, he explains the combination and interaction of the parts by the unity of the whole. He knows that the sole of his foot is part of the same individual unity as the crown of his head; he knows that if a nail runs into the sole of his foot, his mouth utters a cry of pain. But the connexion of the two facts by a series of intermediate links of a mechanical kind lies entirely outside the circle of his ideas. He knows nothing of afferent and efferent nerves, or of molecular processes in brain and muscle. When the nail runs into his foot, his organs of speech emit a cry simply because he is one individual being of which both foot and organs of speech are part. The important point is that as this mode of explanation takes no account of mechanical conditions, it is not subject to mechanical limitations. The sympathetic communion between the parts of a whole need not be conditioned by those relations in space and time on which mechanical interaction depends. It is thus possible to represent the sympathetic

communion as existing even when the supposed parts of the same individual whole are widely separated in space, so that the familiar conditions of mechanical interaction are absent. The ideas and the practices of primitive magic and witchcraft depend in a great degree on this enlargement of the conception of individual unity. Disease or death may be produced by operating on the cuttings of a person's hair, or the parings of his nails, or the remains of his food, when the person himself is far away. Hence it is a common custom with savages to bury their nail-parings, hair-cuttings, and so on, so that what happens to these may not by sympathetic communion cause misfortune to them. In like manner, the nature of a whole is often regarded as in some manner present and operative in the part, even when it has been dissevered from the whole, and acquires connexion with some other individual. In this way the nature of one thing may be in some measure transferred to another. By wearing a tiger's teeth, a man may make himself brave and fierce; by appropriating the belongings of a deceased person, he may share in that person's skill and good-fortune. Instances of this kind are innumerable, and we shall have to refer to them again in the next chapter.[1]

§ 7. Ideal Construction as a Co-operative Process.— Through language, ideal combination becomes a function not of the individual merely, but of a community. It may be confidently asserted that the capacity for ideational thought would be of little use to a solitary animal. Such

[1] It should be remarked that the savage view contains a great truth. Its error and crudity lie in *substituting* explanation of the parts by the whole instead of explanation of the whole by the parts. But it is equally one-sided to suppose that merely mechanical explanation can yield the whole truth. If this were so, there would be no place for philosophy as distinguished from science.

thinking is essentially a social function. Other animals co-operate in work and play, but only men co-operate in thinking. Where many men are united in striving to realise a common end, each single mind is, so to speak, part of one great collective mind. The ideas occurring to each are communicated to all. What occurs to A, to B, or to C respectively may be valueless: but the ideas of A, B, C, taken in combination, may form a real advance: even in combination they may be futile, yet when they reach the mind of D, they may fall on fertile soil and suggest some feasible plan of action or tenable line of thought.

The debt which the individual owes to social intercourse by means of language is two-fold. He is placed by it in possession of data which he could never have acquired by his own personal experience. His thinking is based not only on what he himself has seen, heard, and done, but also on what others have seen, heard, and done. In the second place, he receives from others not merely the results of their observations, but the results of their trains of thought. In both ways his debt to his social environment is immense. His debt is not merely confined to interchange of ideas by means of language. Imitation also plays a large part. In doing or attempting to do what others have done before him, he re-thinks the thoughts which have passed through their minds; and he also in the same process acquires novel ideas, inasmuch as imitation is rarely, if ever, exact reproduction of that which is imitated. The actions imitated are usually more or less modified and lead to new results in the case of each imitator. What has been said holds true for the relations of the men of the same generation to each other; but its application to successive generations is even more important. Every child in learning the language of its ancestors assimilates in outline the whole system of ideas, the whole

system of conceptual analysis and synthesis, which has been acquired by the mental and bodily activity of past generations. It acquires knowledge by question and answer, and by a gradual divination of the meaning of words, as used in ordinary conversation, far more than by direct personal experience. "The words and sentences that fall upon" the "ear" of a child "and are soon upon his lips, express not so much his subjective experience, as the common experience of his kind which becomes, as it were, an objective rule or measure, to which his shall conform. Why, for example, does a child have no difficulty about the relation of substance and qualities that has given philosophers so much trouble? and why do all children understand or seem to understand it alike, whatever their experience may have been? Why? but because the language put into their mouths, and which they must e'en use, settles the point for them, one and all; involving, as it does, a metaphysical theory which, whether in itself unexceptionable or not, has been found serviceable through all the generations of men."[1] We use our own private experiences "mainly to decipher and verify the ready-made scheme of knowledge that is given to us *en bloc* with the words of our mother-tongue. This scheme is the result of the thinking, less or more conscious, and mainly practical, of all the generations of articulately speaking men, passed on with gradual increase from each to each."[2]

The educational influence of one human generation on another is by no means wholly dependent upon the use of language. The importance of the part played by imitation cannot be exaggerated. What men have learned to do in the past, the child has to learn to do over again in its own

[1] Croom Robertson, ***Philosophical Remains***, p. 68

[2] *Op. cit.*, p. 69.

individual case. This is only possible in so far as it attends to the behaviour of its elders, and strives to imitate them. As a matter of fact, the period of childhood is mainly occupied in attempting to reproduce the modes of action current in the society to which the child belongs. Even the play of children is penetrated through and through by this imitative character. Children can take the place of their elders in the next generation only by learning from them those ways of acting which are necessary for the general scheme of social organisation. But in this process they acquire not only bodily dexterities, but also systematic combinations of ideas which they never could have attained by their own unassisted efforts. Besides this, the material environment of human beings is in a large measure a creation of human thought transmitted from one generation to another. Tools, weapons, utensils, buildings, gardens and cultivated fields, are all products of human intelligence. They are material arrangements embodying in outward and visible form trains of ideas which have passed through human minds. Flowing from human intelligence these objects appeal to human intelligence. The child, in learning their nature and use, re-thinks the thoughts which gave them being. In this way, as much as by the help of language and direct imitation, the ideas of one generation are transmitted to the next to be by it further developed, so that from comparatively small beginnings human civilisation may grow like an avalanche ever accumulating and retaining new material as it advances.

Now the lower animals do not in this manner create an environment for themselves by their own intelligence. Bees, ants, nest-building birds, beavers and other animals with definite constructive tendencies may be said in part to make their own environment. But they do not do so in

execution of designs framed by themselves. Their constructions do not embody trains of ideas directed to the attainment of foreseen ends. As their work does not arise from trains of ideas in the first instance, so it does not awaken trains of ideas in the successive generations which repeat the same activities. Each new generation is born with the instinctive aptitudes and propensities of its progenitors and repeats their doings in the same undesigning way. On the other hand, the works of man, as they arise from ideational thought, so they arouse ideational thought. The same understanding which was needed for their production is needed for their reproduction. Hence the educational influence of an environment moulded by human hands to embody human designs does not affect the animals which dwell with man. The human intelligence incorporated in the products of human industry is intelligible only to a mind essentially akin to the human mind.

The external world as an ideal construction is a social product. It must therefore be independent of the individual subject in the same manner and degree as social organisation in general is independent of its individual members. There is thus introduced a new factor in the constitution of external reality—the social factor. The ideal combinations which arise in the individual mind can only become permanent parts of the ideal structure representing the real world if they are entertained by other minds also, and so become current in the society to which the individual belongs. Besides the verification of ideal combinations by actual experiment yielding the corresponding perceptual experiences, another kind of verification is required. Social endorsement is necessary. On the other hand, ideal combinations which are generally current in society tend to maintain themselves in the mind of the individual, even though he has never himself verified them,

and even though his own personal experience is unfavourable to them rather than otherwise. Now and then a person is met with who dares to deny that the earth is round; there is nothing in his direct personal experience to show the roundness; on the contrary, so far as he can observe it, it seems to be flat. Now such a person is generally regarded as a "crank"; he is generally spoken of as a harmless kind of lunatic; and what is more important, he is so spoken of by multitudes of persons who know much less about the matter than himself. The reason is that he is maintaining his own individual ideas against the vast work of ideal construction which has been built up by the co-operative thinking of many generations. It is true that this ideal structure is in process of constant development; and that, as it grows, it rectifies itself, excluding ideal combinations which had previously formed integral parts of it, and receiving into itself others which it had previously rejected. But the earth-flattener does not appear as a representative of this advance: he puts himself forward, or is supposed to do so, merely as an individual setting up his own private thoughts in antagonism to the social product. The experts who are the accredited representatives of the development of the general system of ideas in this direction scout his pretensions: he therefore figures as an isolated individual appearing in the strength of his own private judgment in opposition to the established social order, and he is accordingly regarded by society much in the same way as a lunatic or criminal, the only difference being that he is considered to be harmless and amusing.

This is a case taken from our own complex society, in which ideal construction is so vast in its extent and so diversified that there is no single person who can hold more than a fragment of it, and its various branches are

assigned to the keeping of special guardians. These complex conditions give a certain freedom of play to the individual, which is absent in more simple organisations. In more primitive communities, such as we find among savages, the general stock of ideas is assimilated by each individual, and all are its guardians, though the old men are in this respect more important than the young. Thus the pressure of society upon the individual is incomparably more coercive. Any private rebellion against inherited and accepted tradition would be resented and suppressed with great speed and certainty. Thus primitive societies are intensely conservative and remarkably unanimous in their modes of thought. Each thinks as the rest think, and dares not persevere in any innovation which does not find general acceptance. Ideal activity is on the whole more occupied in finding reasons to justify tradition, or to explain its apparent inconsistency with actual experience, than in further developing and improving the ideal scheme which has been handed down from generation to generation.

CHAPTER VII.

The Self as Ideally Apprehended.

§ 1. General Nature of the Self as Ideally Apprehended. —On the perceptual level, the apprehension of the Self is not yet disengaged from that of the body. For perceptual consciousness, the boundary between the Me and the Not-Me is drawn at the surface of the skin. The clear and explicit opposition of the feeling, willing, and thinking subject to the material world in general, inclusive of the living organism, is a late outcome of mental development. Even when it has been reached, it is only occasionally present to consciousness—in moments of reflection. In the ordinary language of civilized and educated human beings, including philosophers, the word "I" usually refers to the embodied Self, as when we say: "I took a walk," "I trembled with anger," "I hit on this idea while lying in bed."

With the emergence of trains of ideas, the awareness of the Self becomes developed in a two-fold way. In the first place, there is an ideal enlargement of the Self of perceptual consciousness. "We have at this stage not only an intuition of the bodily Self doing and suffering here and now, but also memories of what it has done and suffered in the past,"[1] ideal anticipations of what it will do or suffer in the future, and thoughts of what it might have done or suffered or may do or suffer in various actual or

[1] Ward, art. *Encycl. Brit.*, vol. 22, p. 598.

possible situations. This development does not of itself alter the nature of the Self which is apprehended; it only yields an extended view of the Self of perceptual consciousness. But besides this and in direct connexion with it, another development takes place which introduces a fresh and most important constituent into the object of self-consciousness. This comes to include processes of attending, feeling, and willing as concerned with trains of ideas as well as with things present to the senses. It comprehends thought, volitions, and emotions, which proceed independently of direct transactions between the embodied Self and its actual environment at the time when they occur. It contains remembrances of past trains of ideas, as when we say: "These reflections passed through my mind"; anticipations of future trains of ideas, as when we say: "I shall think over the matter before deciding"; and also references to possible trains of ideas, as when we say: "If I had known what was going to happen, I should have prepared a suitable plan to meet the emergency."

Apart from the fulfilment of further conditions, the awareness of Self at this stage still remains fused with the awareness of the body. But with the growth of ideal processes, there arises an important distinction within the embodied Self, the distinction between an inner and an outer Self. Trains of ideas frequently proceed without any overt motor activity such as is involved in the observation of surrounding things or in practical dealings with them; and it often happens that the ideally apprehended object diverts attention from external impressions altogether. Hence the Self of ideation becomes relatively detached from the embodied Self of perceptual process. On the other hand, it is by no means detached from the perceived body altogether. Intense emotions and desires connected with ideally represented objects, are intimately connected with

bodily changes accompanied by impressive organic and motor sensations; and even where these organic and motor sensations are not specially prominent, they are still present in some degree in all trains of ideas. But as they are localised within the body, the Self of ideational process is distinguished from that of perceptual process as something internal. "There arises a contrast between the inner Self which the natural man locates in his breast" or midriff, "the chief seat of emotional disturbances, and the whole visible and tangible body besides."[1]

§ 2. **The Social Factor in the Development of Self-Consciousness.**—We have so far only given a general account of what constitutes Self as ideally apprehended. We have now to consider the special motives which prompt us to attend to this idea and the constructive processes to which they give rise. These motives are primarily practical, and arise from the relation of different individuals to each other in the same community. In such a community each individual is even more dependent on his fellows and their conduct than he is on his physical environment. We have seen that even for the power of thinking effectively, and so adjusting his actions to physical conditions, he is dependent on intercourse with others by means of language and otherwise. He must be continually adapting himself to his social environment; and to that end he must study the conditions which determine the conduct of his fellows towards himself and towards each other. He must strive ideally to represent their experiences, the impulses which determine their actions, their emotions, their trains of ideas, and so on. In this way he is led to the ideal construction of their subjective history. Now it is true that other Selves are not his own very Self,

[1] Ward, *ibid.*, p. 598.

but they are none the less Selves, though they are other Selves.

Interpretation of the behaviour of others can only be founded on data derived from his own experience of the motives and ideas which prompt and guide his own actions. Thus in the very process of constructing a representation of the subjective experience of others, he must construct a representation of his own subjective experience. He is continually comparing others with himself, noting the points of agreement and difference. Every advance in his knowledge of them is also an advance in his knowledge of himself; and, conversely, every advance in his knowledge of himself is an advance in his knowledge of others. The same result may be reached in a somewhat different way. The individual has not only to consider the attitude of others towards himself, but his own attitude towards them. He must shape his own ways of thinking and acting so as to please them and secure their friendly behaviour towards himself. Thus he is constantly urged to a comparison between what he is and does and what his fellows require of him. In this way he is forced to think about his own thoughts, actions, capabilities, and the like.

In this way the environment of social relationships supplies the prompting motives of an ideal construction, in which the present Self appears as a link in a series embracing the remembered past and the expected future. But this is only one part of the function of the social factor. It not only supplies motives for the ideal construction; it also supplies essential material entering into all developed human self-consciousness. The thought of Self always involves the thought of manifold and complex relations to other selves. A man's own ideal representation of himself includes the view which he thinks others take of him, the view which he wishes them to take of

him, the view which he anticipates they will take of him, or that they would take of him if he acted in certain ways, and so forth.

"The characters, attributes, functions, or other organic constituents of the self commonly extend, from our own point of view, decidedly beyond anything that can be directly presented in any series of our isolated inner experiences, however extended. When one is vain, one's self-consciousness involves the notion that one's self really exists, in some way or other, for the thoughts and estimates of others, and is at least worthy, if not the possessor, of their praise or of their envy. When one feels guilty, one does not and cannot abstract from the conceived presence of one's self in and for the experience of a real or ideal judge of one's guilt. In all such cases the self of self-consciousness thus appears as something that it would not and could not be were there not others in the world to behold, or to estimate it, to be led or otherwise influenced by it, or to appeal to it. It is now from such points of view that the self of self-consciousness comes, in the end, to get form as a being who takes himself to have a social position, an office, a profession—in brief, a vast group of functions without which the self would appear to itself to be, relatively speaking, a mere cipher, while these functions are at once regarded as organically joined to the self, and centred in it, and, nevertheless, are unintelligible unless one goes beyond one's private consciousness, and takes account of the ideas and estimates of other people." [1]

As the idea of Self essentially involves the idea of varying relations to other selves, it will vary according as its relations vary. In relation to enemies it is a combative Self;

[1] Prof. Royce, "Observations on Anomalies of Self-Consciousness," *Psychological Review*, vol. ii., No. 5, pp. 437-438.

in relation to superiors it is a submissive, receptive Self; in relation to inferiors it is a dominant, controlling Self. To quote Royce again: "If I strut about in fancied dignity, my non-Ego is the world of people who, as I fondly hope, are admiring me. Accordingly I then exist, for myself, as the beheld of all beholders, the model. If I sink in despair and self-abasement, my non-Ego is the world of the conceived real or ideal people whose imagined contempt interests, but overwhelms me, and I exist for myself as the despised Ego, worthy of their ill-will. When I speak, my non-Ego is the person or persons addressed, and my Ego is the speaker. If I suddenly note that, though I talk, nobody marks me, both the non-Ego and my Ego dramatically change together in my consciousness."[1]

The influence of the social factor in determining self-consciousness is largely bound up with the process of imitation. It is a conspicuous merit of Professor Baldwin that he has brought this point into full prominence. He distinguishes two phases of imitation—the *projective* and the *ejective*. In the projective stage, imitation is as yet relatively unsuccessful; the mode of activity imitated and the experiences connected with its exercise are as yet more or less beyond the reach of the imitator; they have not yet become part of his existence. The conception of himself involves a contrast between what he actually is or does, and what he is trying to be or do; and this coincides with the contrast between himself and the person imitated. In so far as this is the case, his conception of the other person is *projected*; it contains elements which do not enter into the conception of his own present self, elements which he is only trying to assimilate and incorporate in the conception of himself. On the other hand, when and so far as his imitative efforts have succeeded, this contrast ceases.

[1] *Op. cit.*, p. 443.

His conception of himself coincides with his conception of the other person. In thinking of the other person, he simply ascribes his own experiences to the other person—he *ejects*, or throws them out into the other person, instead of *projecting*, or regarding them as something beyond what he has himself actually attained. "For example, last year I thought of my friend W. as a man who had great skill on the bicycle and who wrote readily on the typewriter; my sense of his personality included these accomplishments, in what I have called a 'projective' way. My sense of myself did not have these elements, except as my thought of my normal capacity to acquire delicate movements was comprehensive. But now, this year, I have learned to do both these things. I have taken the elements formerly recognised in W.'s personality, and by imitative learning brought them over to myself. I now think of myself as one who rides a 'wheel' and writes on a 'machine.' But I am able to think of myself thus only as my thought includes the personal accomplishments of W. . . . So the truth we now learn is this: that very many of the particular marks which I now call mine, when I think of myself, have had just this origin. I have first found them in my social environment, and by reason of my social and imitative disposition, have transferred them to myself by trying to act as if they were true of me, and so coming to find out that they are true of me. And further, all the things I hope to learn, to acquire, to become, all—if I think of them in a way to have any clear thought of my possible future—are now, before I acquire them, possible elements of my thought of others, of the social 'alter,' or of what, considered generally, we may call the 'socius.'"[1]

[1] Prof. Baldwin, *Social and Ethical Interpretations in Mental Development*, pp. 10-11.

To see the full importance of imitation in the development of the idea of Self, we must especially consider the case of children. Children have to learn from their social environment all that is necessary to make them members of the society into which they are born. The normal child is perpetually engaged in acquiring the habits of thought and action of its elders, and in doing so is constantly developing the idea of Self by a process of imitation. Baldwin notes that the child has two characteristic mental attitudes, corresponding respectively to the "projective" and "ejective" phases of imitation. In the first, he is receptive, submissive, and respectful. In the second, he is aggressive, self-complacent, and disdainful or patronising. The two attitudes correspond to different social relations. "The child's sense of himself is . . . one pole of a relation; and which pole it is to be, depends on the particular relation which the other pole, over which the child has no control, calls on it to be. If the other person involved presents uncertain, ominous, dominating, instructive features, or novel imitative features, then the self is 'subject' over against what is 'projective.' He recognises new elements of personal suggestion not yet accommodated to. His consciousness is in the learning attitude; he imitates, he serves, he trembles, he is a slave. But on the other hand, there are persons to whom his attitude has a right to be different. In the case of these the dialectic has gone further. He has mastered all their features, he can do himself what they do, he anticipates no new developments in his intercourse with them; so he 'ejects' them, as the psychological expression is; for an 'eject' is a person whose consciousness has only those elements in it which the individual who thinks of that consciousness is able, out of his own store of experience, to read into it. It is ejective to him, for he makes it what he will, in a sense. Now

that is what the brothers and sisters, notably the younger ones, are to our youthful hero. They are his 'ejects'; he knows them by heart, they have no thoughts, they do no deeds, which he could not have read into them by anticipation. So he despises them, practises his superior activities on them, and tramples them under foot."[1]

§ 3. **The One Self and the Many Selves.**—When we are most intensely and persistently occupied with ourselves, it usually happens that the total Self appears as parted into two phases, each of which is apprehended as a relatively distinct self. As Professor Royce observes, "I can question myself, and wait for an answer; can reflect upon my own meaning; can admire myself, love myself, hate myself, laugh at myself; in short, do or suffer in presence of my own states and processes whatever social life has taught me to do or suffer in presence of the states and processes of others."[2]

The life-history of the individual consciousness embraces a multitude of very diverse and often incongruous states and tendencies. At any moment of self-conscious reflexion, attention is usually fixed on one or other of these special modes of experience. In so far as they differ from each other, and from the present Self which is thinking about them, there is a tendency to regard them as if they were relatively distinct selves. Thus a man, when sober, reflecting on his conduct and on his mental attitude when drunk, can hardly recognise himself as the same person. In fact he is apt to say, "I was not myself," or, "I was not quite myself at the time." The Self of our dreams is usually sharply distinguished from the Self of waking life. The waking Self generally refuses responsibility for the thoughts and actions of the dreaming Self. In such instances, the

[1] *Op. cit.*, pp. 18-19.

[2] *Psychological Review*, vol. ii., No. 5, pp. 454-455.

person feels that there is more difference between himself and these special phases of his life-history than there is between himself and other persons. These are extreme cases, but the principle has a wide application. There is always a tendency to refuse to recognise the Self which is overcome by some sudden or exceptional impulse, or transformed by peculiar conditions, as one and the same with the normal Self.

The same antithesis is found not only in reflecting on past states, but also in the moment of present consciousness. When the mind is divided by conflicting impulses, it often appears as if there were two *quasi*-persons in the same individual consciousness, and as if the one were criticising the other, contending or expostulating with it. The analogy of the relations between ourselves and other persons is transferred to the relation between conflicting groups of tendencies within our own consciousness. The best example, perhaps, is the conflict between moral principle and temptation. In such cases one of the two conflicting tendencies is often identified with our true Self, *i.e.* with the normal flow of thought and action; and the other tendency is regarded as something relatively foreign and intrusive. "If the tendency to the estimated act is a passionate tendency, a vigorous temptation, and if the conscientious judgment is a coldly intellectual affair, then the situation dimly reminds me of cases where other people, authoritative and dignified rather than pleasing, have reproved my wishes. . . . But if, on the other hand, the conceived act is less keenly desired, and if my conscientious plans are just now either fervently enthusiastic or sternly resolute in my mind, then . . . I myself am now, in presence of the conceived act, as if judging another."[1]

[1] Royce, *op. cit.*, p. 454.

We must add to the actual past and present selves those which may exist or might exist in the future, or might have existed in the past. There is always an antithesis between ourselves as we are or have been, and ourselves as we wish to be or wish that we had been. It is always possible in reviewing the past to transform the picture of it so as to represent ourselves as thinking, feeling, and acting, not as we have actually thought, felt, and acted, but as, from our present point of view, we should wish to have thought, felt, and acted. We can disregard actual conditions and limitations, and mentally endow ourselves with powers and qualities which we neither possess nor have possessed, and we can imagine situations especially fitted to call them into play, and evoke the admiration of our social environment. Without going to such extremes as this, a man may simply say to himself, "Oh! what a fool I have been! Why did I not work instead of play?" and the like; and he may allow his mind to follow out, by a train of ideal construction, representations of what he would have been in the past, present, and future, if he had acted otherwise. Such ideal constructions are most common in reference to the future, especially in the young. There is a tendency to represent what the Self of the future is to be and do, and what is to happen to it, in its social and other relationships, in accordance with present desires. This is sometimes mere day-dreaming; but it may also be of the greatest practical importance; for a man's future, unlike his past, is to a large extent under his own control. By dwelling on the representation of himself as he would wish to be, instead of as he is, a direction is given to his activity, which actually tends to realise his ideal. When the ethical end is said to be self-realisation, what is meant must be the realisation of a future Self constructed by abstracting from the imperfections and limitations of the present Self.

§ 4. *Pathology of Self-Consciousness.*—Under normal conditions, the tendency to regard various actual or possible phases of the Self as if they were more or less distinct persons is not carried so far as to mistake metaphor for literal fact. The man still knows or can always remind himself that he is not in reality split up into a plurality of personalities, distinguished from each other in the same way as one person in society is distinguished from another person. But in many cases of insanity the analogy is no longer mere analogy for the patient. So great a transformation is brought about in the train of his experiences, that the present phase of his life-history is altogether discontinuous and discordant with his past. At the same time, the present phase is so persistent and engrossing, and the idea of the past relatively so feeble, that his whole actual bygone history is either partially ignored and partially re-constructed or is ascribed to some other person. Cases are extremely common in which insane patients believe themselves to be such great personages as Napoleon, the Messiah, or even God the Father, and act accordingly as far as lies in their power. "A soldier, whose skin had become insensible, believed himself to have been dead since the battle of Austerlitz, where he received a wound. When he was asked as to his health, he said: 'You want to know how Father Lambert is? But there is no Father Lambert, a cannon ball killed him at Austerlitz; what you see here is not he; it is a wretched machine made to look like him; you ought to ask them to make a better one.' In speaking of himself he never said *me*, but always *it*." [1]

Such delusions as this depend on a profound change in the nature of personal experience, which makes the present

[1] Taine, *On Intelligence*, p. 377.

discontinuous with the past. Nervous disorders tend to bring about such breaches of continuity. In general, a change in the experiences connected with the body, and especially with organic sensation, seems to be an essential factor in the process. Sometimes the resulting illusion relates specially to the bodily Self, and does not profoundly affect the continuity of personal existence in other respects. Thus a patient whose bodily sensations have become abnormal will feel as if he were made of glass or butter, and come to suppose that he actually is composed of such materials.

But when the illusion is not limited to the bodily Self, but involves a transformation of the individual's whole idea of his life-history, the reason probably lies in profound alteration of emotional tone. Organic sensation is a highly important factor in emotional states; alteration in it may either produce or be attended by a general change of emotional attitude. But emotions are not merely specific modes of feeling: they also involve characteristic conative tendencies, either in the way of expansive and aggressive activity, or of shrinking and aversion. Now we have seen that these conative tendencies may be initially vague and undirected to specific objects, and that, so far as this is the case, they fasten on any object they can find. When they have not an object, they make one for themselves. Thus a herd of cattle, enraged by the sufferings of one of their number, will vent their fury on the innocent victim, if no enemy or other object of resentment obtrudes itself on their attention.

Thus emotions, in so far as they are initially vague, tend to define themselves. On the ideational plane, the process of definition takes the form of ideal construction. If the emotional moods due to pathological conditions are sufficiently profound, intense, and persistent, whole systems of

ideas will arise in this way which may be quite discontinuous and discordant with the actual past experience of the subject. Now emotional moods in human life commonly arise in connexion with certain social situations. These same moods when they arise pathologically may define and explain themselves by the ideal representation of corresponding relations between the patient and his social environment. "Suppose that one's depressed emotional condition, as in melancholia, or at the outset of a delirium of suspicion or of persecution, contains emotions resembling the normal emotions of conscious guilt, or the feeling of social dread. Then these feelings tend to assimilate in one's actual surroundings, or in one's memories, data which suggest, to one patient an actually believed social condemnation of his deeds, or an actual judgment of his inner conscience passed upon his sinfulness, while to another patient his own sorts of emotion suggest an especially hostile scrutiny of his appearance by the passers-by, or an inner sense that he must hide from possible scrutiny. On the other hand, feelings quite the reverse of these suggest to the exalted general paralytic whatever remembered or fancied social relations, expressing his vast powers, the fragments of left-over social habits which still survive in his chaos permit him, in passing, to express."[1]

Now the idea of Self is so bound up with the idea of social relations, that an ideal re-construction of these involves an ideal re-construction of the Self also, and in extreme cases this amounts to a breach of continuity between the past and present Self, so that they appear to be separate persons.

In other cases, the two Selves appear to be simultane-

[1] Prof. Royce, *Psychological Review*, vol. ii., No. 5, pp. 456-457.

ously present and at strife with one another. Sometimes the subject identifies himself with one of them, and sometimes he is perplexed as to which of the two he really is. It very often happens that this division of the Self into two, one of which appears as a foreign person, is determined by hallucinations. Thus in some cases a man's thoughts appear to be stolen from him because, independently of his own volition, the words which he uses within his own mind to express his ideas utter themselves either in the form of auditory hallucinations or at least hallucinations of the muscular sense. "The thoughts are his own. The sounding of them forth, in this way, is not his. His thoughts run off his tongue, get spoken in his stomach, creak out in his shoes as he walks, are mockingly echoed or in the end commented upon by another power."[1] He explains the mocking repetition by ascribing it to another person who is hostile and contemptuous, and he fills out the idea of this other person in various ways, attributing motives to him and supplying him with words appropriate to his character.

§ 5. **The External and the Internal Self.**—The idea of the Self includes in all but its latest and most abstract developments the idea of the body as the vehicle of perception and motor activity. At the level of ideal construction there is an additional motive for regarding the body as part and parcel of the Self. The idea of the Self essentially includes the idea of its relation to other selves. But it can only exist for other selves in so far as it appears to them in bodily form.

But however important the body may be, it can never be regarded as the whole Self or even as the most essential part of the Self. Its attitudes and movements, so far as

[1] *Ibid.*, pp. 455-456.

they differ from those of other material things, appear to be initiated by something inside the organism. They follow on volitions, emotions, painful and pleasant sensations, and the like. These experiences constitute the inner Self, and the body as it presents itself to the external observer is their instrument used in a way more or less analogous to that in which other material instruments are used.

The contrast between inner and outer Self is made explicit, as we have seen, by the process of ideational thinking, in which the body may be apparently quiescent, while the mind is active. The same is true of dreams. Thus even in primitive stages of human development, we find an antithesis recognised between the body as outer husk and the soul as inner kernel. But we find that the more primitive modes of representing the existence of the inner Self differ essentially from our own. Modern theories regard the soul as simply an immaterial substance, or identify it with the brain, or say that it is just the continuous flow of conscious states themselves. All these views are very remote from those which are naturally and inevitably taken in earlier stages of mental development. The savage cannot find out what the inner Self is by exploring the inside of the body, for this is possible only after death; and after death the inner Self no longer manifests its local presence. Thus *post mortem* examination can only show that the inner Self is not an internal organ of the body; that it is not the brain or heart or lungs. On the other hand, the conception of a simple immaterial substance, or of a mere series of conscious states, pre-supposes a development of the power of conceptual abstraction entirely beyond the reach of the savage. In all his practical dealings with the world, he has to do with things extended in space and appreciable by his

senses. Even in his social relations, other persons only exist for him in their bodily presentment. Now we have seen how very slow and gradual a process it is by which the primitive mind disengages what is essential in a conception from the irrelevant material in which it is imbedded. This makes it impossible for the savage to disengage in its abstract unity the conception of a purely immaterial existence. Hence, in ideally representing the internal Self, he follows the analogy of his general experience of personal beings. The internal Self is for him more or less a repetition of the external Self. "If a man lives and moves, it can only be because he has a little man inside who moves him." [1]

This mode of thinking is perhaps partly originated and in any case it is strongly confirmed by certain special experiences. Among these dreams play a prominent part. A man who is absent or dead appears to another in his dreams. The impression of the actual presence of the person dreamt of is often extremely strong, and easily suggests the theory that, though the ordinary external body is lying in the grave or at a distance, the inner counterpart of this body, the soul, has actually appeared to the dreamer. But such apparitions are not confined to dreams. All pathological conditions of body and mind, due to disease, drugs, hunger, exhaustion, and so on, tend to produce hallucinations of this kind; and these conditions are very common among savages, much more so than among ourselves. Add to this the extreme difficulty which the human mind finds in realising the termination of personal existence after death. The difficulty is not merely that of realising annihilation in the abstract, but of realising that the dead person has ceased

[1] Fraser, *The Golden Bough*, vol. i., p. 121.

to play his habitual part in the ordinary life of the living. The habits of thinking and acting of his surviving friends and relatives have grown up and become fixed on the assumption of his presence among them. There is always a conflict between these pre-formed habits and the new conditions introduced by his decease; and the conflict is often intense and distressing. The survivor feels a shock of surprise, often painful, when he misses his intimate friend from his usual place. His rooted habits of thought lead him ideally to represent the dead as still having an existence analogous to his existence when alive. He is thus prepared to meet illusions, hallucinations, and dreams, in which the dead appear once more with the personal appearance and garments of the living, with no incredulity. On the contrary, the natural and necessary explanation for his mind is that what he sees is actually present. We must remember that physiological and psychological theories of the origin of dreams and hallucinations are utterly beyond the range of savage conception.

The relation between the ordinary body and the internal impersonation is not conceived in a merely mechanical way. The unity of the whole individual is not accounted for by the interaction between the internal Self and the external Self. On the contrary, the reason why body and soul are in sympathetic communion lies ultimately in the bare fact that they form part of the same individual. In ordinary waking life, the soul is supposed to be locally present in the body. But it may depart from the body without severing the connexion between them. At least a modified form of sympathetic communion may still continue between them. The final departure of the soul means the death of the body; but a temporary departure is often supposed to involve only illness, or trance, or

dreams. The sympathetic communion which is independent of local presence is well brought out in the case of dreams. The savage will ascribe the soreness and fatigue of his body to the painful struggles which his soul has undergone in dream wrestlings with other souls during its temporary migrations. So presents and sacrifices to the departed are usually offered at the tomb as if to the body; the benefit goes to the soul. It is very commonly believed that the burying of the body with appropriate rites is an indispensable condition of the soul's welfare. Thus the Greeks supposed that the shades of the dead must haunt the banks of Styx or wander about the earth, until their bodies received the rites of sepulture. After these, they could pass to the under-world and mix with their own kind. It is instructive that the regions to which departed spirits are supposed to go are in primitive thought generally represented as faint reproductions of the actual world, and the society of ghosts as analogous to the society of the living, retaining such relations as that of master and slave, rich and poor, and the like.

Since the spirit is only occasionally visible and still more rarely tangible, and since in general the relations of the living to it are somewhat vague and dim, there is a tendency to regard it as being itself shadowy and unsubstantial. But on this point primitive thought vacillates a great deal. We often find the spiritual body represented as existing and behaving in much the same manner as an ordinary body. It is sometimes represented as eating and drinking, wrestling and fighting, and even as intermarrying with the living. Marriage between a living person and a disembodied spirit is not uncommon in Chinese folk-lore. But these are exceptional cases. Familiar dealings with spirits are most often supposed to be the privilege of magicians and medicine-men, who often

make it a regular part of their profession to catch departed souls in snares, and either detain them in custody, or bring them back to the body to which they belong.

If there are two material impersonations of one individual, there is no reason in the nature of the case why there should not be more. As a matter of fact we find that primitive thought often recognises the existence of several. The explanation of shadows and reflexions by optical laws is beyond the range of the savage mind; they are accordingly interpreted in accordance with the system of ideas familiar to primitive thought. They are impersonations of the whole individual, much as the soul is; sometimes they seem to be identified with the soul, but they are often regarded as distinct. There is a Polynesian story of a girl who stole a young man's shadow and imprisoned it in a bottle; she then set it free and projected it upon a pool of water. "As the man moved about in his own land, so the shadow moved on the water."

Sometimes different impersonations are supposed to have different functions. Thus the Tshi-speaking people of the Gold Coast ascribe to each individual two impersonations besides his body,—the *srahman*, or soul, and the *kra*. The *kra* is especially connected with the phenomena of dreaming, and of birth and heredity. In dreams and visions it passes out of the body; after death it acquires connexion with some other body, so that each man's *kra* has passed through a long series of distinct embodiments. The *srahman*, or soul, cannot leave the body without suspension of obvious vital functions. After death, it passes to deadland, which in social and other arrangements is a counterpart of the world in which it has previously lived. If the man has died before completing the proper term of life, the *srahman* lingers about its former habitation. During life, body, *srahman*, and *kra* are regarded

as different impersonations of the same individual, so that what happens to any of them may affect the whole. The incidents in a dream are believed to be adventures of the *kra*. "If a native, having taken a chill overnight, awakes in the morning with stiff and aching muscles, and the usual symptoms of muscular rheumatism, he at once concludes that during the night his *kra* has been engaged in some toilsome pursuit, or in a conflict with another *kra*, and he attributes the pain he feels to the exertions made or the blows inflicted."[1] Here the locally separate experience of the *kra* is the experience of the whole man, including the soul and body.

The primitive view of the internal Self as a counterpart of the external body has only been very gradually displaced by the growth of civilisation. Even among ourselves at the present day it is very far from being extinct. People still believe in ghosts which appear under the form and even in the clothes of the living person. It is true that these ghosts are for the most part regarded as very attenuated forms of matter, and there is a popular impression that they are impalpable, although visible. But they are sometimes represented as being very palpable indeed. There is one described in a popular monthly magazine which "twisted up gunbarrels like so much soft paper."[2]

As the progress of thought and knowledge brought into clearer light the unity and continuity of the material world, the conception of the material soul became modified. There was a tendency to explain its origin as part of the general course of physical nature, and its resemblance to the external body was no longer insisted on. The view

[1] Ellis, *The Tshi-speaking Peoples of the Gold Coast of Africa*, p. 151.

[2] *Pearson's Magazine*, March 1898, p. 255.

taken was that life and consciousness were properties of a certain form of matter diffused throughout the physical universe. The cue to this theory was given by the phenomena of breathing and of vital heat. The general soul-substance from which individual souls were supposed to be derived was air rarefied by heat. Examples of doctrines of this kind are to be found in some of the pre-Socratic philosophers. Anaximenes regards the soul as being essentially air, and air as being essentially of the nature of soul. Air in general is to the universe what our own soul is to us. Heracleitus regards breathing as a connexion between the internal soul and the surrounding air from which it is originally derived.

In later times, when the doctrine of an immaterial soul became generally accepted, the old material soul was still frequently assumed to exist together with it in human beings and instead of it in "brutes." We often find a division of psychical functions between the material and immaterial souls. Ethical and religious functions were often ascribed to the immaterial principle, while lower functions, such as sensation and animal appetite, were ascribed to the material principle. Even in comparatively recent times, we sometimes find some ordinary conscious functions ascribed to the material soul. Thus Bacon says: "The sensible soul—the soul of brutes—must clearly be regarded as a corporeal substance, attenuated and made invisible by heat; a breath (I say) compounded of the natures of flame and air, having the softness of air to receive impressions, and the vigour of fire to propagate its action. . . . This soul is in brutes the principal soul, the body of the brute being its instrument; whereas in man it is itself only the instrument of the rational soul."[1] To this

[1] *Works* (Spedding and Ellis), vol. iv., p. 398.

sensible soul he ascribes at least sensation and feelings of pleasure and pain.

The last important survival of the doctrine of the material soul in scientific thought is contained in the doctrine of "animal spirits," as held, for example, by Descartes. The animal spirits consist of a fine form of matter constituting a connecting link between the body and the soul, but they are no longer regarded as themselves capable of any kind of conscious experience. They are merely part of the mechanism by which the immaterial principle acts on the body and is acted on by it. Thus the material soul for Descartes is a soul no longer; it is merely a mode of matter, and like all other matter sharply and rigidly distinguished from all conscious existence. With the advance of modern physiology, it became displaced even from this position, and was recognised as a figment.

CHAPTER VIII.

Belief and Free Imagination.

§ 1. **General Distinction of Belief and Free Imagination.**—In discussing the ultimate ways in which the conscious subject, as such, may be related to its objects, we distinguished the attitude of mere supposal from that of belief or judgment, and we recognised simple apprehension as common to both. When I see a match-box, I may think of matches being in it. This is simple apprehension. I may, besides this, mentally assert that the box actually does or actually does not contain matches. My attitude is then one of belief. But I may also merely think of the presence or absence of matches as being possible alternatives without regarding either alternative as actual fact and without even raising the question which of them is actual fact. In this case, my attitude towards the objects which I call the existence of matches in the box and the non-existence of matches in the box is one of supposal. I may, on this basis, proceed to affirm that "if there are no matches in the box, somebody must have been using it." Here there is belief in the whole proposition, that "if there are no matches in the box, somebody must have been using it." But I do not believe either that "there are no matches in the box" or "that somebody has been using it." These propositions are only supposed, and what I believe in is a certain connexion between them. Here suppositions enter as subordinate constituents into a proposition which, as a whole, is an object of belief. For

the purpose of the present chapter, such cases of tied supposal will be regarded as belonging to the domain of belief. What we are here concerned with is the distinction between belief in this wide application of the word and the free play of imagination.

In the free play of imagination, judgment or belief is subordinate in so far as it is present at all. The process consists primarily in a flow of suppositions connected in an ideally constructed whole, which *as a whole* is merely supposed and not asserted as actual fact. Telling a story which we make up as we go along, or reading a novel, or day-dreaming, are obvious examples.

§ 2. **Distinction between the Conditions of Belief and Imagination.**—A man sitting in his arm-chair can easily imagine himself killing a lion by a blow of his fist. But suppose that he meets an actual lion, and has to look to his own safety. This ideal combination is no longer possible for him; the idea of the lion pouncing on him and tearing him to pieces takes possession of his mind, and excludes the fanciful picture of his own powers. The same may happen without his actually encountering the lion. If in his arm-chair he is planning a hunting expedition to take place the next day, such ideas as that of killing lions with a blow of the fist will be excluded, and they will be the more completely excluded the more strenuous he is in the pursuit of the practical end in view.

This example brings out the essential distinction between the conditions of Belief and Imagination. All belief involves objective control of subjective activity. The nature of the object thought about enforces certain ideal combinations to the exclusion of others. But this objective control is not absolute; it is conditional. It depends upon the end towards which mental activity is directed. So long as the subject is strenuously aiming at the achievement

of practical ends, only certain combinations of ideas are possible for him, but if his mind is not bent on the achievement of practical results or on the attainment of new knowledge, almost any ideal combination may be possible for him which does not involve an explicit contradiction. He cannot imagine a thing as being at once round and square, black and white; he cannot mentally make two straight lines include a space, without destroying their straightness; but apart from such limitations, he can ideally construct all manner of relations; he can combine horse and man so as to form an image of a centaur; he can picture a giant with a hundred heads, and so on.

There is always some restriction on the play of ideal construction, besides that due to overt contradiction; but the restriction in each case depends on the general direction of mental activity at the time. So far as the restriction exists at all, the mental attitude is one of belief; the flow of ideas being restricted by the nature of the object. Thus if we are thinking of normal men and women, we may mentally frame a narrative about them which has no reference to any actual man or woman whom we have seen or heard of. So far, the play of our ideas will be relatively free; it will not be bound down by conditions of date and place; none the less, it will be tied, inasmuch as we are not at liberty to introduce into our mental construction features at variance with the normal nature of human beings. We must not make them breathe fire, or have their heads beneath their shoulders. So far we are bound by the distinction between the credible and the incredible. There is no belief in the narrative as historical fact; but belief about human nature in general is involved in it through and through. On the other hand, suppose that the play of his imagination does not refer to actual human beings, but to certain creatures of its own; it will then have

much wider range, but it will still be more or less guided by initial assumptions. The subsequent flow of ideas will be restricted by the anterior flow of ideas; if a man has started by imagining fairies inhabiting flowers, he cannot think of them as giants inhabiting castles; so that even in this case there is a certain amount of objective restriction and consequently of belief.

Now objective restriction is at its maximum in the pursuit of practical ends, and in the pursuit of knowledge. It is therefore only in these cases that we find full belief,—belief which is not blended with imagination, but contrasted with it. For a moment we may confine our attention to practical activity. The primary motives of ideal construction lie in practical needs. Ideal combinations are first framed with a view to efficient action. Only those therefore are sought for which will make action efficient. By ideal representation a man builds a bridge across a stream before he comes to it; but the one thing important to him is that the bridge shall not give way when he comes to use it. Hence the flow of ideal construction is strictly limited. Only such ideal combinations are of use as can be translated into corresponding perceptual experience; others, therefore, are as far as possible excluded. In so far as ideal constructions break down on being translated into terms of perceptual activity, the attitude of disbelief arises. What has happened is the actual fact; what was anticipated is contrasted with it as a false opinion. In this way the antithesis between the true and the false, between the credible and the incredible, becomes widened and deepened.

It appears from this that the attitude of belief and disbelief is prior to the free play of imagination. But even the savage is by no means always in a strenuously practical mood. He has his time for play as well as for

work; and among other forms of play, he indulges in the play of ideas. When he is comfortable and idle, it gives him pleasure to represent things not as they are, have been, or will be, but as he would like them to be, or in any way which may happen to interest him. He may communicate his imaginings to his comrades, and they may be handed down from generation to generation. Such works as the plays of Shakespeare, or the novels of Thackeray, are examples of the most advanced development of this mode of mental activity.

§ 3. **General Conditions of Belief.**—There are two main points of view from which the problem of belief must be approached. It is at once a condition of activity, and conditioned by activity.

"The relation of belief to activity," says Bain, "is expressed by saying that 'what we believe we can act on.'"[1] This may seem to be a statement rather of a consequence than of a condition of belief. But a closer scrutiny will show that the criticism is superficial. Just because belief is a condition of activity, activity must be a condition of belief. To strive after an end is to strive after the means necessary for its attainment. Hence in striving after an end, we strive after the belief which alone makes action with a view to that end a psychological possibility. Thus practical and theoretical needs play an essential part in determining what we shall and shall not believe. This holds good in the pursuit of theoretical as well as of practical ends. The man of science, eager to advance knowledge, clings to *working* hypotheses; he clings to them because they are useful to him. He is apt to meet criticism by urging that no one ought to pull down a man's house until he has himself constructed a better. Whether

[1] *Mental and Moral Science* (1872), p. 372.

the end aimed at be a practical result or an increase of knowledge, in both cases the mind presses forward towards its mark as best it may, shaping those beliefs, and clinging to those beliefs, which are most helpful to it, and passing by those alternatives which would hamper and paralyse its activity.

The activity which is concerned with the increase of knowledge is in order of development subsequent to the activity which directly pursues practical ends. The ideal construction which is directly subservient to action brings into being a connected system of ideas concerning the world and the Self. Theoretical activity consists in further development of this same system of ideas without direct reference to practical results. It is no free play of the imagination, but consists in the formation of beliefs, just because it is the further development of a pre-formed system of beliefs. The conditions and limitations of this system as a whole apply to all enlargements of it. It excludes or refuses to include all merely imaginary combinations.

Let us now turn to the other side of the question. Belief is not only conditioned by mental activity, but also involves restriction of mental activity. Objective coercion is of the very essence of belief. Whatever influence subjective needs as such may have in determining belief, they can never be the sole factor. In framing a belief, we endeavour to represent real existence as it is in its own nature, independently of our own individual consciousness. Where we feel that it is purely a matter of our own arbitrary choice whether we shall think of *A* as *B* or as *not-B*, there is no belief or disbelief. There is a state of doubt when this freedom of choice is accompanied by an effort to find something not ourselves which shall determine us one way or the other, so that we shall be able to

arrive at a belief. There is a mere play of imagination when this endeavour to arrive at a belief is absent. For actual belief or disbelief, some restriction of subjective freedom is necessary.

Thus belief is at once dependent on activity and on limitation of activity. This is no contradiction; on the contrary, the two points of view ultimately coincide. Belief depends on subjective tendencies, just because these tendencies cannot work themselves out without it. Ends can only be realised by the use of means; but in order to use means we must have some belief in their efficacy; hence the impulse to pursue an end is also an impulse to form beliefs which will make action for the attainment of the end possible. But it is not within the range of our arbitrary selection to determine *what* means will lead up to a given end, and what will not. This depends on the nature of the real world in which we live. There must therefore in the framing of a belief be always some endeavour to conform to conditions other than, and independent of, our own subjective tendencies. Our inability to attain ends otherwise than through certain means constitutes a restriction of mental activity within more or less definite channels. If wishing were identical with having, our freedom would be absolute, and there would be no such thing as belief. The nature of the steps which will issue in a certain result are fixed independently of us. In devising means to an end, we are not free to make what mental combinations we will. Our thinking, to be effective, cannot be free; we can no more attain our ends without submitting to control independent of our wish or will, than we can walk independently of the resistance of the ground on which we tread.

§ 4. Variation in the Relative Importance of the Subjective and Objective Factors of Belief.—There are, then,

two factors which co-operate in the formation of belief,—one subjective, and the other objective. Neither of these factors is sufficient by itself; both must be operative. But their relative importance may vary greatly. The keen urgency of practical needs may make it necessary to come to a decision where objective data are scanty. He who climbs a cliff to escape death by drowning must use whatever foothold presents itself, though he would never have trusted to it without pressing motives. So where there is a practical need to form a belief, because indecision would paralyse activity, the mind must rest on whatever objective indications or suggestions it can find, however slight these may be. On the other hand, where there is no interest to be satisfied, there will be no tendency to form a belief. The mind will occupy itself only with those questions which lie in the line of direction of its own activity.

The influence of the subjective factor is the more prominent and dominant, the more primitive is psychical development in general. Primitive beliefs are nearly all relevant to the narrow circle of immediate practical interests within which the activities of the savage are confined. Wherever these interests are involved, they take shape in a body of belief often resting on what appear to us extremely frail objective foundations. The primitive mind does not concern itself, or only slightly concerns itself, with questions which fall outside the range of its narrow circle of practical interests. But increasing knowledge finds relevancy where ignorance fails to find it. Thus in neglecting whatever does not obviously relate to immediately engrossing needs, the primitive mind must neglect much which is really relevant to them. Hence, in the formation of belief, data of the utmost importance will be ignored because their relevancy is hidden and cannot be made apparent without patient

mental effort. Thus the narrower is the circle of interests, the greater is the predominance of the subjective factor, because the mind is blind to objective data which do not obviously connect themselves with its immediate aims and tendencies.

Besides constituting the impelling motives for the formation of belief, the subjective factor also contributes to determine the nature of the beliefs which are formed. When a negative judgment would paralyse activity, the active tendency is a force arrayed on the side of the positive judgment, and *vice versâ*. If a certain ideally represented combination presents itself as the only condition, or the most favourable condition, of attaining a certain end, the active tendency towards this end is of itself a tendency to believe in the ideally represented combination. If denial of this is tantamount to sacrificing a cherished aim, the whole strength of desire helps to enforce the affirmative side. Thus persons of vigorous and courageous temperament are apt to believe what they wish to believe. Indeed this is sometimes stated as a maxim holding good of human beings in general. *Tarde creduntur, quae credita laedunt,* says Ovid; but we must not push this view too far. Where the general mental attitude is one of fear, or timidity, or gloomy suspicion, it does not hold good. Fear or timidity or gloomy suspicion favours belief in disagreeable alternatives. Where the tendency is not to face and fight difficulties and dangers, but to evade and escape them, action will be most effectively guided by taking the most unfavourable view of the circumstances. Even if an alarm is false, it is better to be on the safe side. There is much in the religious superstitions of savages which shows manifest traces of this influence of fear upon belief.

It should be clearly understood that the distinction

between the subjective and the objective co-efficients of belief is not a logical but a purely psychological distinction. Whatever condition controls and limits subjective activity, so as to enforce one way of thinking and to make other ways difficult or impossible, is from the psychological point of view an objective coercion. It may be that the control thus exercised does not really proceed from the nature of the object as known to more highly developed minds. Logical analysis from the point of view of higher knowledge may show that what is operative is some association of ideas, which, though it may be vivid and insistent, is none the less casual and irrelevant. But for a mind which is unable to recognise it as casual and irrelevant, the coercive power of the association must appear as if it proceeded from the nature of the object represented.

The words "casual" and "irrelevant" imply that a systematic view of objective relations has already been formed, and that this system excludes the connexion of things or events suggested by the association which is called irrelevant and casual. But a mind which has not attained to this systematic view cannot distinguish between control really proceeding from the nature of the object, and control proceeding from what is recognised at a higher standpoint as a merely casual connexion of ideas. Hence savages appear to us to confuse objective with subjective necessity. Any association between *A* and *B* through which the idea of *A* vividly and insistently calls up the idea of *B* may lead to a belief in a real connexion between them. If in a fit of anger we trample on a man's portrait, it is difficult for the moment to avoid believing that we are by the act doing the man himself a direct injury. The savage has a real and permanent belief that men can be injured in such ways. He thinks,

for instance, that by destroying a man's footprints he can spoil his journey or make him lame. So the Chinese believes that by hanging up in his house ancient coins he secures for himself the protective influence of the spirits of the emperors under whom the coins were issued. Such instances are innumerable. There is nothing in the beliefs thus formed which is at variance with the preformed system of beliefs. On the contrary they are in full harmony with this. Hence subjective interests together with vivid and insistent associations of ideas exercise unresisted control.

One main reason why the subjective factor is more dominant in primitive thought is that the preformed body of belief is comparatively small in extent and imperfectly organised. A body of belief is more fully organised in proportion as the denial of this or that combination of ideas which enters into its composition involves a greater and more destructive alteration in the whole system. Savage beliefs are not woven into a unified whole to nearly the same extent as civilised beliefs; hence the influence of the objective factor is smaller. For the influence of pre-established convictions in determining the credibility or incredibility of new suggestions is in its nature objective. However the old beliefs have been formed, and whether they are true or false, they are affirmations or denials of real existence. Whatever is rejected because of its inconsistency with them, and whatever is accepted because its denial would be inconsistent with them, is accepted or rejected because it is felt to be implied in or excluded by the constitution of the real world. Thus the influence of the objective factor develops as the general body of belief grows in extent and becomes more highly systematised.

In this process, when it is carried far enough, truth

must be the gainer; for error cannot ultimately be made self-consistent. But in relatively early stages of the process the result is to a large extent of an opposite kind. Beliefs shaped in ignorance, under the pressing urgency of practical needs, help to produce new beliefs, and give rise to an organised system of error, so that the united force of the whole resists interference with any part of it.

§ 5. **Influence of the Social Factor.**—Ideal construction is, as we have seen, a social product. Hence the beliefs of the individual are to an immense extent shaped and determined by the beliefs current in the community in which he lives. This is an objective factor of paramount importance. But its logical value of course depends on the process by which current beliefs at first came into being. When these have no adequate basis in fact, their social endorsement simply serves to safeguard them against doubts to which the experience of individuals might otherwise give rise. If a belief in witchcraft, for instance, is already established in a community, those persons who think they have in their own experience evidence for its reality will have an immense advantage over any individuals who may venture to oppose them. The most acute reasoning and exhaustive research will have little chance against the most flimsy and prejudiced tale of old women causing sickness in children or preventing the cows from yielding milk. It must seem futile and perverse to put forward other explanations of these phenomena when there already exists an established explanation which, so to speak, forms part of the social order.

The adverse critic is an eccentric person who sets his individual fancy in opposition to the whole community. He is promptly suppressed. It is however a very rare thing that such a critic should arise within the community itself apart from the intrusion of foreign influences.

The people of a community often maintain their beliefs by trusting one another, as the inhabitants of the Scilly Islands are said to have eked out a precarious livelihood by taking in one another's washing.

§ 6. **Some Features of Primitive Belief.**—We have seen that the formation of new beliefs depends at every step on the nature of the beliefs which are established. Thus, in reviewing the history of human thought, we have to take account of two points. On the negative side we have to remember that complex systems of ideas which are familiar to us have not yet come into being in earlier stages of development. In particular, the power of mechanical construction, and the mechanical understanding of natural process was in the beginning extremely rudimentary and limited in the range of its application. Hence there are certain general conditions of interaction between material things constantly recognised by modern culture which are not present to the mind of the savage, or even to the ignorant members of civilised society. For early thought, it is abstractly conceivable that anything should act on anything else. The unity of the individual thing determines the connexion of its parts; it is not the connexion of the parts which produces the unity of the thing. Hence there is no reason why the component parts of the individual whole should not interact even when they are separated from each other in space. Besides this, the primitive view of what is and is not part of an individual whole differs from ours. The savage is in this respect powerfully influenced by associations which we should call casual and irrevelant. Whatever he has habitually connected in thought with a person or thing, he is disposed to regard as part of that person or thing, and as having sympathetic communion with it. He continues to associate vividly the dead body with the ghost, the amputated

limb with the man who has lost it, and he cannot help feeling that what is done to the body makes a difference to the ghost, or that what is done to the amputated limb makes a difference to the man who has lost it. Similarly, he habitually associates a man's clothes, or his tools and weapons, or his other belongings, with the man himself; in thinking of the personal belongings, he is impelled to think of the person, and he is led to regard them as part and parcel of the total personality. Hence these external appendages are for him no mere external appendages; the unity of the individual is present and operative in them. By appropriating a dead man's spear, he may appropriate his skill and good-fortune, and the like. The unity of the world in general is vaguely conceived after the analogy of the unity of the individual thing. The unity of the world is not explained according to a system of uniform and abstract laws regulating the connexion of its parts. On the contrary, things and events are supposed to be capable of sympathetic communion just because they form part of the same world. Anything from this point of view may be really connected in determinate ways with anything else. Specific characteristics, powers, and modes of behaviour will appear as ultimate and inexplicable. They will appear as what we should call occult qualities intrinsic to the things themselves, and not as admitting or requiring further analysis or explanation. Any interaction or real connexion may be accepted as a fact, if it be vividly impressed on the mind in relation to some strong practical interest. For example, there is no keener or more widespread practical interest than that which is felt in the course of future events. Hence we find all over the world a belief in signs and omens, and methods of divination. Often appeal is made in various ways to a superhuman being supposed to possess prescience. But in the most

simple cases, anything which is found suggestive to the persons interested may be regarded as a sign. Among the Tshi-speaking tribes of the Gold Coast, divination is practised by the priests in a variety of ways as they are guided by the caprice of the moment. In time of war, a method of ascertaining which party will get the better is to haul on a rope fastened to a tree till it breaks. While it is being pulled, the names of the combating parties are called out alternately, and the name which is called out at the moment when the rope breaks is that of the party which will gain the advantage. We may compare the belief in fortune-telling by cards, which is sometimes found among ourselves.

This then is the first point to be emphasised in contrasting cultured with savage thought. The limitations imposed on our ideal construction by our pre-existing knowledge, and especially by our mechanical view of nature, are non-existent for the savage mind. But besides considering the ideas which are absent from the savage mind, we must also consider the positive nature of the ideas which are most predominant in his thinking. We have seen that the conception of individual unity is familiar to him and constantly utilised by him; but among all individuals those which are most familiar, interesting, and best known are human beings,—himself and the members of the society in which he lives. Hence the constant and prevailing tendency which we find in primitive thought to interpret all things in terms of personal life and personal relations. Whatever arrests his attention and fixes his interest as a source of good and evil to himself is regarded by him as having some sort of conscious existence more or less analogous to his own. This is possible because of his failure to understand the mechanical explanation of natural events and processes. When the structure and operation of a piece of mechanism

is fully understood, it can no longer be regarded as a separate and independent agency prompted by internal impulses, analogous to the will of personal beings. But where the principle of action is regarded as something ultimate and independent, intrinsic to the nature of the individual thing, there is nothing to prevent the mind from treating the agency as personal or quasi-personal. The cataract or the whirlpool appears a living thing to the poet in his poetic moods; for in these moods he ignores the fact that the water is simply behaving in accordance with certain abstract laws under certain given conditions. This fact is not *ignored* by the savage; it has never been realised by him. Hence, what may be a transient play of imagination in the civilised mind, is the permanent and serious attitude of the savage mind. It is permanent and serious because it is prompted and upheld by practical needs. In presence of personal agencies, he can never feel himself utterly helpless. He can always attempt to influence them as he influences his own fellows in society. He can propitiate them by offerings, by prayers, by self-humiliation, by flattery, and even by threats and punishments. Of course, these means often fail; but they fail frequently in the case of human beings. Personal caprice and perverseness introduce incalculable elements into the problem. But this only serves to make possible the survival of the anthropomorphic point of view. Failure can always be explained, and apparent success can always be regarded as convincing evidence. Continued malignancy on the part of the supposed personal agency can always be ascribed to deep resentment of neglect shown to it, or of injury done to it, consciously or unconsciously. Besides, it is always possible to say that things would have been still worse if proper methods had not been taken.

It has been shown that the primitive conception of

personal existence differs in many points from our own; and this difference appears in the mode of personifying natural objects and agencies. Just as the human person has an internal and external self, personified things have also an internal and external self; and as the internal self in the case of human beings is a sort of duplicate of the body, so all things which are regarded as separate agencies are supposed to have spirits of a similar kind. Hence the widespread savage doctrine that everything has its "double." The ghost of a spear may exist and kill people after the spear itself has been destroyed. When sacrifices of food, clothes, and utensils are made to the dead body, their spiritual counterparts are appropriated by the soul. We saw that the same individual may have not only two but many impersonations of this kind, all in sympathetic communion with each other, so that the unity of the whole is present and operative in all of them. This is even more true of natural agencies personified, when they are powerful and important. Savage deities often originate and are conceived in this way. To select an instance at random, there is a god called Behnya worshipped by the Tshi-speaking tribes of the Gold Coast. Behnya is primarily a river; he has also a human shape, with whip and sword. He has an image and stool, which used to be washed with the blood of human victims offered to him. The body of the human victim was cut into small pieces, and distributed round the outskirts of the town, rendering it impossible for a hostile force to make an entrance. There was also a certain rock in which his influence was present and operative. Thus the river itself, the human shape, the image and stool, the pieces of the body of the human victims, and the rock were all separate vehicles of the influence of Behnya. He was impersonated in all of them.[1]

[1] Ellis, *The Tshi-speaking People of the Gold Coast*, chap. v.

CHAPTER IX.

Feeling-Tone of Ideas.

§ 1. **Introductory.**—The pleasures and pains of ideational processes have two sources. They are either due to a remnant of the feeling-tone of an actual sensation or perception persisting in ideal revival, or they arise independently in and through the ideational process itself as an activity directed toward an end. It must also be borne in mind that trains of ideational thought always have an accompaniment of organic sensation faint or intense. They occasion changes in the common sensibility, which have often a conspicuous feeling-tone.

§ 2. **Revived Conditions of Feeling-Tone.**—Feeling-tone cannot be directly revived. Its recurrence depends on the re-instatement of the original conditions of production. Now the reproduction of the percept in the ideal image is at the best only partial, and we should therefore expect the revival of feeling-tone to be partial also. Much allowance must of course be made for differences between individuals; but it may be said generally that the pleasures and pains of actual sensation are very faintly echoed in the corresponding ideal images. Some apparent cases of intense revival are illusory, being really due to concomitant organic sensations. Thus the idea of undergoing a surgical operation may produce a widespread and intensely disagreeable disturbance of common sensibility; but the feeling-tone does not belong to the mere idea of being cut, etc. Excluding such cases, it would seem that strictly

sensational pleasures and pains occur only to a very limited extent in imaged revival. We must however guard against making too absolute a statement. Probably persons who can visualise colours with great vividness can also enjoy them in their ideal re-instatement, in a way approaching more nearly the actual sense experience than persons who visualise poorly can readily comprehend.

The pleasures and pains due to perceptual combination in space and time are in general more perfectly recoverable by those who have a sufficient power of mental imagery. The man who can visualise distinctly and vividly may, in recalling before his mental eye a picture or a landscape, renew to a large extent his original enjoyment of it. There are some few persons gifted with an exceptional power of auditory revival who can enjoy music almost as well in reminiscence as in actual hearing. The main drawback they find is the effort which it costs them. Actual hearing is very much easier.

In actual perception an object may be pleasing or displeasing, not through the immediate feeling-tone of the sensations which it produces or their grouping in space and time, but through the previous experiences with which it has been connected. The sight of a bunch of grapes may give pleasure in part because we have had the experience of eating grapes. The feeling-tone is due to the re-excitement of the cumulative disposition left behind by previous experiences of the object. Now this cumulative disposition is also re-excited in ideal revival, and with it the feeling-tone. In general, the agreeableness or disagreeableness of the ideal revival is not so intense; but apart from interfering conditions, it is generally present in some degree. Poets often produce their best effects by accumulating references to objects round which pleasing associations cling. Tennyson's *Brook* is a good example.

I wind about, and in and out,
With here a blossom sailing,
And here and there a lusty trout,
And here and there a grayling,

And here and there a foamy flake
Upon me, as I travel,
With many a silvery waterbreak
Above the golden gravel.

In this and similar poems, a number of objects pleasantly toned by the cumulative effect of past experiences are referred to in succession, and the total result is extremely agreeable.

A very important source of ideal pleasures and pains lies in the reminiscent revival of past activities in which we have been triumphant or defeated. The greater the difficulties overcome, the greater in general is the pleasure of reminiscence. Where we have been successful after a struggle, the pleasure of ideal revival is often much more unmixed than the pleasure of the original experience. In recalling past obstacles and difficulties, we have always the consciousness that they have been overcome, and this reduces to a minimum the disagreeableness of the original struggle. We are not bound to dwell on the unpleasant parts of the experience at more length or in more detail than is required to enhance the pleasures of success. Even where we have been defeated, reminiscence is often more pleasing than displeasing. The reason is that the mere lapse of time has raised us to a point of view from which we can regard past success or failure as a matter of indifference. This in itself is a kind of victory. If the reminiscence of our past struggles continues on any ground to be interesting, it gives us pleasure rather than pain.[1]

[1] Of course this is not the case when the consequences of past defeat continue to affect unfavourably our present position.

Besides this we can always skip more or less lightly over occurrences which would be disagreeable even in their ideal revival.

All that we have said about revival of feeling-tone must be understood with one important qualification. It is necessary to distinguish between the attitude of imagination and the attitude of belief. The mere ideal representation of an object may in itself give pleasure or pain; but this must not be confused with the pleasure or pain arising from our belief in the existence or non-existence of the object under given conditions. Doubtless the pleasure of ideal revival is at its maximum when it takes the form of the pleasure of anticipation. A person living in a crowded city may take pleasure in ideally recalling trees and woods and mountains as a mere play of imagination. But a new source of intenser pleasure arises when he finds that he can take a holiday and actually visit the scenery of Scotland or Switzerland. The reverse occurs when his mind is disagreeably disturbed by the thought that these things are beyond his reach. "A busy man reads a novel at the close of the day, and finds himself led off by a reference to angling or tropical scenery to picture himself with his rods packed *en route* for Scotland, or booked by the next steamer for the fairyland of the West Indies. Presently, while the ideas of Jamaica or fishing are at least as vividly imagined as before, the fancied preparations receive a rude shock as the thought of his work recurs."[1] The "rude shock" is due to the direction of attention to the actual existence or non-existence of what has been previously merely imagined. This brings with it a desire for the actual experiences themselves. The belief that they are out of reach thwarts this desire and produces pain which

[1] Ward, *Encyclopaedia Britannica*, p. 588.

displaces, often though not always completely, the pleasures of imagination. In general, the thought of a pleasing object which is recognised as beyond our reach gives pain rather than pleasure when there is a desire for its actual possession. To enjoy the pleasure of ideal revival in the case of unattainable objects, we must be able to adopt the attitude of imagination or make-believe, and this is very often impossible.

§ 3. Feeling-Tone of Ideational Activity itself. Belief.—Ideational activity may assume two forms. On the one hand, it may be directed to the production of some new result in the real world, or to the increase of our knowledge of the real world; on the other hand, it may be a mere play of the imagination. The conditions of pleasure and pain in the two cases are not quite the same, and it will be well to treat them separately. In both cases whatever furthers activity so as to make it more efficient, conduces to pleasure; and whatever obstructs it and makes it inefficient, conduces to pain.

We shall consider first those trains of ideas which are directed towards the production of real results or the increase of knowledge. Two modes of furtherance and obstruction may be distinguished,—the material and the formal.

Material obstacles consist in ideally foreseen circumstances which would actually bar the way to the execution of a plan or to the occurrence of a desired event. As Spinoza says, whatever hinders the body's power of acting hinders the mind's power of thinking; whatever would, in fact, obstruct the execution of a plan, obstructs the formation of the plan, when it is ideally foreseen. If I am planning an excursion and discover that the railway arrangements at a certain place are fatal to its execution, this circumstance arrests the flow of my ideas just as it

would arrest their realisation. The belief that a certain event will occur interferes with the ideal train of thought, just as the event itself would interfere with the actual train of occurrences. What has been said of obstacles is equally true of furtherances. The prevision of circumstances which would facilitate the execution of an ideal scheme facilitates its formation.

Formal obstacles and furtherances are those which depend on the form of the flow of ideas and not on the ideas themselves. They are due rather to error, ignorance, misapprehension or confusion on our part, than to the actual circumstances of the case. Doubt and contradiction arising at a critical point arrest the flow of ideas, just as the positive prevision of an external obstacle does. If in laying our plans for an excursion we discover, not that the train arrangements at a certain place are unfavourable, but that we have no means of finding out what they are, the flow of mental activity is held in suspense. The belief that there will, and the belief that there will not, be a train fit for our purpose are equally justified and unjustified, so that their conflict blocks the onward progress of thought. Suppose now that one authority, *A*, says that there will be a train, and another, *B*, that there will be no train, the state of suspense is intensified. The doubt arising from ignorance passes into the doubt arising from positive contradiction. The statement of the one person furthers and stimulates activity, while the statement of the other suppresses it. If in the long run we come upon evidence which proves that a train runs just at the time we want it, there is a release from tension and an onward bound in the flow of thought which constitutes a highly pleasurable furtherance of activity. Similarly, apart from any previous doubt or contradiction, the mere fact that we find ourselves able to arrange the details of a complex

plan so that they fit into each other without hitch or hindrance, is a source of pleasure.

Another formal condition of pain is the struggle to find connexion between data which in spite of our efforts continue to appear detached and isolated. This is perhaps best illustrated when we are attempting to follow the train of thought in another person's mind, either by reading or listening. We are looking for a logical connexion between the statements which follow each other; but if the exposition be bad, or the subject-matter too hard for us, we find incoherence instead of coherence, and the greater our mental effort the more painful it is. A corresponding pleasure is felt when facts which have been previously disjointed and detached in our minds are brought under one point of view, and shown to be exemplifications of the same principle working under different conditions. Here the efficiency of mental activity is increased. "When we discern a common principle among diverse and apparently disconnected particulars, instead of all the attention we can command being taxed in the separate apprehension of these 'disjecta membra,' they become as one, and we seem at once to have at our disposal resources for the command of an enlarged field and the detection of new resemblances." [1]

We have laid down the general principle that obstruction of mental activity is painful, and its furtherance pleasant. This is true, if properly understood; but there are complications which are apt to cause confusion if they are not carefully explained. Above all, it must be noted that an obstacle to the attainment of an end does not necessarily bring mental activity to a standstill. What is really painful is dead strain comparable to pushing against an

[1] Ward, *Encyclopaedia Britannica*, p. 583.

unyielding wall. But an obstacle, whether formal or material, to the attainment of an end, may heighten instead of arresting, the flow of ideas, just as the dangers of mountaineering call into play the resources of the climber, thereby increasing his bodily and mental activity, and contributing to his pleasure. A difficulty in face of which a man feels himself helpless is painful in proportion to the strength of the conative tendency which it thwarts. On the other hand, a difficulty which calls his powers into fuller and more varied play may be a source of pleasure. Whether it will be actually so or not depends upon the special conditions of the case. It is necessary to distinguish between two kinds of end: in the one, it is part and parcel of the end that it should be attained in a certain way by our own activity; in the other, it is a matter of indifference whether it occurs with or without our co-operation. If we are trying to hit a mark with a stone, it will give us no satisfaction for somebody else to hit the mark; it will give us no satisfaction to walk up to the mark and place the stone on it. So in guessing a riddle it gives us comparatively little satisfaction to be told the solution; the pleasure lies in finding it out for ourselves. On the other hand, if we are hungry and desire food, we are perfectly content to have it placed on the table for us. Our satisfaction is not at all diminished by the fact that we did not prepare it ourselves; on the contrary, the necessity of preparing it ourselves would in most cases be an actual drawback.

We have stated the contrast between these two kinds of ends, so as to bring out the antithesis between them as sharply as possible. But as a matter of fact, they are for the most part blended with each other, satisfaction lying partly in the attainment of the final result, which we may call the material end, and partly in the process of attaining

it, which we may call the formal end. We may suppose that Œdipus was a man who delighted in guessing riddles; and ordinarily his satisfaction would lie in finding out the answer for himself. But when he had to deal with the Sphinx, his satisfaction would mainly consist in the deliverance of Thebes, and in his own escape from being eaten. Now in the case of an ordinary riddle, difficulty would be mainly a source of pleasure,—because it would give scope for the fuller exercise of his mental powers. But in guessing the riddle of the Sphinx, the conditions are essentially altered; for here the welfare of Thebes and his own life were at stake, and these interests had a much greater relative importance than the exercise of his ingenuity in guessing riddles. Thus, inasmuch as the difficulty threw doubt on the attainment of the material end, it would bring unmixed pain, which would probably overwhelm and overbear the ordinary pleasure of Œdipus in overcoming intellectual obstacles.

We may sum up as follows. The continuance of a conation in face of an obstacle gives rise to mere dead strain, and is therefore painful, in so far as the subject feels himself powerless to deal with the obstacle. On the other hand, so far as the obstacle calls into play the resources of the subject to overcome it, it heightens free mental activity, and to that extent gives rise to pleasure. But even in this case a condition of pain is introduced if and so far as the presence of the obstacle makes doubtful the attainment of that final result of activity which we have called the material end. The pain is the greater, the stronger the doubt is, and the greater the importance of the material end.

We must carefully distinguish between obstructed activity and diminished activity. An obstacle blocking the onward progress of a train of thought has for its first

effect an intensification of the conative tendency which it renders ineffective. It is only in a gradual way that the conation diminishes in intensity, until it is displaced by some other activity. This takes a longer time the stronger the interest involved.

The removal of an obstacle, either by our own activity or by external circumstances, is a source of pleasure. The resulting pleasure is by no means a mere equivalent of the pain of previous obstruction. Sometimes it is less, and very often it is greater. When the preceding tension is not too prolonged and intense, the pleasure of relief for the most part exceeds the pain which is its pre-condition. Thus such an activity as solving a chess-problem is predominantly pleasing, in spite of periods of dead strain, in which there appears no hope of solution. So a novel with a good plot creates pleasure by a series of alternating checks and releases of mental activity. The extreme case is found in certain forms of the ludicrous. A pun impels the mind to identify objects utterly disconnected with each other. This of course involves a conflict, and an obstruction of the flow of thought. But the obstruction is so transient that it scarcely gives rise to anything that can be called pain at all. On the other hand the relief which comes with insight into the true state of the case may be a source of keen pleasure. Mental activity suddenly obstructed and so heightened is immediately set free, and is so much greater than the situation demands that it has nothing to do but enjoy itself.

It should be noted that the same conditions which increase or further mental activity may also be the conditions which initially excite it. Let us take the case of a man who finds, either that he has come into a fortune, or that he has lost one. Consider first the sudden transition from poverty to riches. One effect may be the opening of

the field for the satisfaction of conative tendencies which actually played a large part in his conscious life in the period of poverty. But besides this there will be many tendencies which were comparatively latent while he remained poor, partly because they were displaced by more pressing needs and partly because of the hopelessness of attempting to satisfy them. The sudden accession of wealth will open a free field for the satisfaction of these previously latent tendencies, and it will at the same time transform them into conscious conations. In the opposite case of the rich man becoming poor, many conscious ambitions and projects will be crushed; but besides this there is much in his mode of life as a rich man to which he has paid no attention because it has been a mere matter of course and of routine. But his routine habits, so soon as they are obstructed by poverty, become changed into conscious conations; the same condition which denies these conations satisfaction, calls them into being.

§ 4. **Feeling-tone of Ideational Activity itself. Imagination.**—One grand characteristic of the play of imagination is the absence of what we have called the material end. The end is simply the working-out of the ideational process itself, apart from any special result to be produced in the real world or in the advancement of our knowledge of it. This gives imagination a great advantage as a pleasure-yielding activity. In pursuing material ends, we are subject to the real conditions on which their attainment depends. We are thus compelled to face all the obstructions and difficulties which the constitution of the real world imposes. In imagination, on the other hand, limiting conditions are imposed by ourselves. If we begin by fancying that we are as strong as Samson, and proceed to fancy that we meet a lion, this is only a favourable opportunity for rending the lion like a kid. If on the

other hand we actually anticipate meeting a lion, the problem is how to avoid being rent ourselves. We need introduce no obstacles into the flow of imaginative activity, except such as can easily be overcome by imaginary conditions and so serve to enhance our pleasure on the whole. Take for example such an imaginary narrative as Dumas' *Monte Cristo* or *The Three Musketeers*.

Of course there must be a certain internal coherence in the play of imagination. Explicit contradictions give rise to the pains of obstruction as they do in the pursuit of practical ends or of knowledge.

Besides the logical incoherence arising from explicit doubt or contradiction, there is also a kind of incoherence affecting the formation of the idea of an object, apart from reference to its existence or non-existence. Under this head comes incongruity between the structure of an object and its function. The function of a pavement is to be trodden on, and for this purpose the more level it is the better; if it is worked in mosaic, so that its parts appear in relief, the effect on the eye is unpleasing. We may know quite well that it is even; but its apparent unevenness interferes with our idea of a pavement. The same kind of unpleasantness is produced by the sight of a key so elaborately decorated that it appears unfit for its proper function. Similarly the lover of books feels discomforted if he sees a favourite volume upside down on the shelves. Unpleasantness may be due to mere violation of habit. Most people who have been accustomed to the ordinary English mode of spelling are annoyed when they see words like *honour* and *colour* spelt *honor* and *color*. This effect is intensified in so-called "phonetic spelling." If in a picture shadows do not fall as the direction of the light requires, the result is unpleasing even before the incongruity is explicitly detected and formulated. Simi-

larly, incongruities in the development of character in a novel obstruct the flow of ideas and create the impression of unnaturalness, even though no contradiction is explicitly recognised. This kind of incoherence may attach to all forms of ideational activity. It is here brought under the head of imagination, because it affects the flow of ideas as such in distinction from beliefs concerning existence and non-existence.

§ 5. **Sentiment and Emotion.**—After the full treatment of emotion in Bk. iii., Pt. ii., Ch. v., it is not necessary to say much more about it at this point. What is true of perceptual process holds, *mutatis mutandis*, of ideational. On the perceptual plane, the actual presence of a dangerous situation excites fear; on the ideational, the ideal prevision of a similar situation has a similar effect. All the general characteristics of emotion which we enumerated in Bk. iii., Pt. ii., Ch. v., § 1, apply equally to perceptual and ideational process.

There is only one point which appears to require more extended treatment at this stage. We noted that emotions, so far as they have not their primary origin in organic change, usually exhibit a parasitical character. They are in the main secondary phenomena, and pre-suppose the existence of more specific tendencies. The anger, for instance, produced in a dog by taking away its bone presupposes the specific appetite for food.

Now on the ideational plane the specific tendencies which condition the occurrence of emotion are incomparably more varied and complex than the primary perceptual tendencies. All the various systems of ideas which grow up in the process of ideal construction of the world and of the Self have their conative aspect. Each system of ideas is a general tendency to feel and act in certain ways under certain circumstances. It is convenient to have a general

name for ideal systems considered from this point of view. It does not appear that any better word can be selected for the purpose than *sentiment*, though in so employing it we extend its application beyond the range of ordinary usage. If we give this extended application to the word, we may regard emotions which pre-suppose mental dispositions organised through previous trains of ideational activity as episodes in the life-history of sentiments.

The credit of first drawing attention to this distinction between emotion and sentiment belongs to Mr. Shand, and we cannot do better than quote his words. Emotions "are in a sense adjectival and qualify a more stable feeling. Whereas the specific organisation of our sentiments,—affection for our friends, the home-sentiment, and every sentiment that we can use the term 'love' to express, as love of knowledge, art, goodness, love of comfort, and all our interests, as interest in our health, fortune and profession, interest in books, collections, self-interest,—these, so far from being mere adjectives and qualifying other feelings, are the relatively stable centres to which the first attach themselves, the substantives of these adjectives, the complex wholes which contain in their possible life-history the entire gamut of the emotions.

In the love of an object . . ., there is pleasure in presence and desire in absence, hope or despondency in anticipation, fear in the expectation of its loss, injury, or destruction, surprise or astonishment in its unexpected changes, anger when the course of our interest is opposed or frustrated, elation when we triumph over obstacles, satisfaction or disappointment in attaining our desire, regret in the loss, injury, or destruction of the object, joy in its restoration or improvement, and admiration for its superior quality or excellence. And this series of emotions occurs, now in one order, now in another, in every senti-

ment of love or interest, when the appropriate conditions are present.

Now consider how these same emotions repeat themselves, often with opposite objects, in the life-history of every sentiment which we name dislike or hatred. There is pain instead of pleasure in the presence of the object, desire to be rid of it, to escape from its presence, unless we can injure it or lower its quality, hope or despondency according to the chances of accomplishing this desire, elation or disappointment with success or failure, anger or fear when it is thrust upon us and persists, surprise when the unexpected occurs, regret or grief, not in its loss or injury, but in its presence and prosperous state."[1]

The distinction between emotion and sentiment is to a large extent a distinction between dispositions and actual states of consciousness. Such a sentiment as friendship cannot be experienced in its totality at any one moment. It is felt only in the special phase which is determined by the circumstances of the moment. If we are parting from our friend, we feel sorrow; if we are about to meet him after long absence, we feel joy. The joy and the sorrow are actual experiences; but the sentiment which includes the susceptibility to either, according to circumstances, cannot in its totality be an actual experience. It is a complex emotional disposition[2] which manifests itself variously under varying conditions. These varying manifestations are the actual experiences which we call emotions. Thus we may say that so far as actual experience is concerned the sentiment is constituted by the manifold emotions in which it manifests itself. But this must be understood

[1] "Character and the Emotions," *Mind*, N.S., No. 18 (April 1896), pp. 217-218.

[2] See Bk. iii., Pt. ii., Ch. v.

with an important qualification. We must not suppose that all sentiments are capable of manifesting themselves in the same emotions. On the contrary, the character of the emotion is specifically different according to the nature of the sentiment on which it depends; and the difference may be important enough to justify a different name for the emotion.

This is specially exemplified in the distinction between the emotions which have reference to personal and to impersonal objects respectively. The "emotions common to our love of whatever object become complicated with new differentiations in the love or hatred of a human being. Pleasure in the presence of the object, desire for it in absence, for the preservation of its existence, for its superior quality, anger or fear when it is threatened, hope, admiration, disappointment, regret, recur, and constitute the love of the object, of its well-being; but the specific emotion of sympathy is differentiated. The nearest approach to this in our love of inanimate things, or those great constructions of our thought, business, knowledge, art, morality, is the interest we take in the continuance of the object, in its improvement, or heightened quality, and, conversely, in the pain which any loss of quality, injury, or destruction occasions. Now if we supposed the object were self-conscious and took pleasure in its own continuance and improvement, and felt pain in its injury or lowered quality, there would then occur a sympathy or identical feeling excited in two conscious beings in reference to the same object. Thus, where human beings are concerned, there necessarily arise coincidences of this sort which, multiplying in those common situations where danger or injury is present, develop the emotion of sympathy as a new component of the love of the object. And in the process of development, pity acquires a qualitative flavour

distinguishing it from the pain felt in the injury or destruction of inanimate objects.

"In the next place, the pleasure felt for the excellence or superiority of an object that we love, develops into the new emotions of respect and reverence: respect where there is a superior power or quality which fails to win admiration, reverence where this superior quality is recognised as moral. And both admiration and something of fear blend in this emotion and give to it a flavour and specific quality of its own.

"Lastly, consider how the regret or sorrow that we feel when we have injured any object that we are interested in or love, where human beings are concerned, and our action is not accidental but the outcome of anger, or the change from love to hatred, differentiates the new emotions of remorse and repentance. Repentance is no mere revival of this same universal sorrow or regret; it has acquired a character of its own with the blame that we pass on ourselves, the futile effort to recall and undo the past, the hope and desire and resolution to make the future different. And remorse too has a character of its own, with the fear and even horror that blend with it, the regret for what has been done, without the hope and resolution of repentance, but rather with a deep despondency or despair which sees no possible escape." [1]

[1] *Op. cit.*, pp. 218-219.

CHAPTER X.

Voluntary Decision.

§ 1. Ascending Levels of Conative Development.—Conative development is inseparably connected with cognitive development. If we consider conation in the abstract, we can distinguish its positive from its negative phase,—appetition from aversion. We can also distinguish its varying degrees of intensity and persistence and its feeling-tone. But beyond this all differentiation of conative consciousness is differentiation of cognitive consciousness. This does not imply that conation is secondary to and dependent upon cognition. The whole course of exposition in this work refutes such an assumption. What is meant is rather that conation and cognition are different aspects of one and the same process. Cognition gives the process its determinate character: without conation there would be no process at all to have a character.

From this point of view, we may distinguish different levels of conative process as connected with different levels of general mental development. On the plane of perception we have the perceptual impulse; this includes instinctive impulses. Its general characteristic is that the activity involved in it finds immediate expression in bodily movement guided by external impressions.

The perceptual impulse without losing its essential character may involve a certain amount of ideal anticipation. But we reach a distinctly higher plane when ideas

become "sufficiently self-sustaining to form trains that are not wholly shaped by the circumstances of the present." "We can desire to live again through experiences of which there is nothing actually present to remind us."[1] The mere ideal representation of an end may be the primary starting-point of an activity directed to its realisation; and this activity may itself partly or wholly take the form of trains of ideas. It is at this stage that the word *desire* has its most appropriate application. Perceptual conations are better described as impulses.

With the development of ideational thought, higher forms of desire arise. The process of generalisation brings with it generalised conative tendencies. We aim at the fulfilment of rules of conduct instead of the production of this or that special result in this or that particular case. Ideal construction sets before us ends which have never been previously realised. These ends may be so complex that they can only be realised gradually by activities persistently renewed as opportunity allows. The writing of a book, and sometimes the reading of it, may serve as an example. Sometimes the ideally constructed ends are such as the individual recognises to be unattainable in his own lifetime. He can only contribute his share towards bringing them to pass. Sometimes there is a doubt whether they can be completely attained, or even a certainty that they cannot be completely attained. Ends of this last kind are the highest, and are generally called "ideals."

§ 2. Conative Aspect of the Conception of the Self.— Under the concept of the Self as expressed in the word "I" is included in systematic unity the life-history of the individual, past, present, and future, as it appears to himself and to others; together with all its possible or ima-

[1] Ward, *op. cit.*, p. 588.

ginary developments. We have already described the way in which this complex ideal construction grows up. We have now to point out that its evolution accounts for the origin of Will in the strict sense of the word, as implying deliberation and choice.

Voluntary action is to be sharply discriminated from impulsive action, and deliberation from conflict of impulsive tendencies. The difference is, that in impulse action follows the isolated conative tendency; whereas in voluntary decision special conations and their ends are first considered in their relation to the total system of tendencies included in the conception of the Self. When two disconnected impulses simultaneously prompt to incompatible courses of action, if the conception of Self does not come into play, one interferes with the other in a quasi-mechanical way. There is merely a trial of brute strength between them. Instances are sometimes found in young children and animals. The characteristic expression of their mental state is a sort of oscillation between two modes of action, each of which is begun in turn and then gives place to the other. "When a young child suddenly comes face to face with a strange dog, the impulse towards . . . and the impulse away from . . . are realised in quick succession. The child goes up to the dog, runs back to its father, approaches the dog again, and so on."[1] Professor Titchener tells us that "in face of the two impulses, (1) to shut a door on the right hand, and (2) to seat himself at his typewriter-table on the left," he actually began "a right-hand movement towards the door and then all at once" slued round "to the typewriter, without having closed it."[2] All of us can no doubt recall similar experiences.

[1] Titchener, *Primer of Psychology*, p. 246.
[2] *Ibid.*, p. 247.

Deliberation in no way resembles this alternate jerking in opposite directions, as if pulled by a string, and the decision which follows it is not a mere triumph in strength of one isolated impulse over another. Voluntary action does not follow either of the conflicting tendencies, as such; it follows our preference of the one to the other. It is the conception of the Self as agent which makes the difference. The alternative is not "this?" or "that?" but "shall *I* do this?" or "shall *I* do that?" Each line of action with its results is considered not in isolation but as part of the ideally constructed whole for which the word "I" stands. The impulse of the present moment belongs to the Self of the present moment; but this is only a transient phase of the total Self. If the impulse is realised the completed action will take its place as a component part of the life-history of the individual. He may live to regret it. In his present mood, with bottle and glass before him, he may desire to get drunk; but sobriety may have been the habit and principle of a lifetime. If he yields to temptation, the remembrance of the act will stand out in painful conflict with his normal tendencies. He will be unable to think of it without a pang. This incompatibility between the normal Self and the present impulse, if vividly enough realised at the moment of temptation, will restrain him from drinking. If it is not sufficient, further developments of the conception of Self may be more efficacious He may think of himself as churchwarden or elder; he may think of the ideal aspirations of his better moments; he may call to mind the thought of himself as reflected in other minds,—the dead friend who expected so much from him, and who would be so shocked at his lapse,—the talk of the general public conceived as pitying, contemptuous, or malicious. He may even consider how he would like to look back to such an episode on his death-bed. Ob-

viously, this detailed development of what is included in the man's conception of himself as a whole might go on interminably. As a matter of fact, it is possible that it would not be needed at all. He might simply say, "What! *I* do such a thing? How could the thought ever have occurred to *me*?" In this case the mere concept of the Self in its vague totality without detailed development would be sufficient to produce a decision. The thought of *getting drunk* attracts the man; but the thought of *his* getting drunk repels, so as to give rise to instant rejection of the suggested course of action.

§ 3. **Deliberation.**—Very often, however, the thought of the Self does not at once give rise to a decision, positive or negative, but only to arrest of action, so as to give time for deliberation. It may be that the way in which this or that line of conduct, if realised, would affect the Self as a whole, past, present, future, and ideal, can only be brought before consciousness with sufficient fulness to determine action by a more or less prolonged train of thought. When this is so, the concept of the Self as a whole will not directly tend to reinforce or suppress a desire; it will rather tend to postponement of action, until the concept of Self and of the action and its consequences are developed in such detail in relation to each other that a decision becomes possible. In this way arises Deliberation. The alternatives before the mind in deliberating may be simply doing a thing or leaving it undone; or they may include two or more definite and incompatible lines of action. In principle, there is no essential difference between the two cases. When two or more definite lines of action are considered, each of them has to be brought into relation with the general concept of Self, and from this point of view they have to be compared with each other.

The general point of view in deliberation may be

described as follows. A certain line of action being suggested as possible, I contemplate myself as I shall be if I put it in execution, so as to make it part of my actual life-history, and on the other hand I contemplate myself as I shall be if I leave it undone. I follow out this representation of a hypothetical Self in more or less detail until that turning-point in the process which is called Voluntary Decision emerges.

In the more developed forms of deliberation there is a kind of mental see-saw. Now one alternative, and now another, comes predominantly before consciousness, and the mind is variously attracted and repelled by each in turn. The desires and aversions which arise in this way are called Motives. Hence the process of deliberation is often called a Conflict of Motives. Motives are not mere impulses. They come before consciousness as reasons why *I* should act in this or that way. They are not independent forces fighting out a battle among themselves, while the Ego remains a mere spectator. On the contrary, the motives are motives only in so far as they arise from the nature of the Self, and pre-suppose the conception of the Self as a determining factor. From this it follows that the recognised reasons for a decision can never constitute the entire cause of decision. Behind them there always lies the Self as a whole, and what this involves can never be completely analysed or stated in the form of definite reasons or special motives.

While the process of deliberation is going on, the motives are motives for deciding: when the decision is made, the triumphant motives become motives for action. Or, to put the case in another way, while the process of deliberation is going on, the competing desires are regarded as possible motives for action: when the decision is formed, they become actual motives for action.

§ 4. **Voluntary Decision.**—The phrase *voluntary decision* is ambiguous. It may mean the transition from the state of suspense to the state of resolution; or it may mean the state of resolution when it has once been attained. It will be simplest to treat first the decision as already formed, the state of being resolved. The most obvious difference between the state of indecision and that of decision is that in the first we do not know what we are going to do, and that in the second we do know what we are going to do. While deliberating, we are making up our mind, and we do not know what our mind is going to be. When we have formed a decision, we have come to know our own minds. The conception of the Self has become fixed where it was previously indeterminate. The realisation of one line of conative tendency is now definitely anticipated as part of our future life-history, so far at least as external conditions will allow of its execution. Opposing conative tendencies either cease to operate, or they appear only as difficulties or obstacles in the way of carrying out our decision. They are no longer regarded as possible motives of action. We have come to the settled belief that, so far as we are concerned in our present state of mind, the lines of action to which they prompt will not be carried out. They are thus placed outside the sphere of deliberation, and in consequence cease to be motives. If they persist at all, they merely serve to make the execution of our voluntary decision more painful and difficult. But they do not on that account impair the strength of this decision; on the contrary, they may only give an opportunity for exhibiting the strength of the decision. With the full emergence of the decision, the conflict of motives, as such, ceases. "This termination of the struggle does not merely mean that one impulse or group of impulses has turned out to be stronger than its opponents. It might conceivably manifest its superior

strength without a cessation of conflict. When two unequal and opposite forces are applied to a particle, the particle will move in the direction of the stronger force; but the action of the weaker force still continues to manifest itself in a diminution of velocity. The triumph of the voluntary impulse is not of this kind. In a perfect volition, opposing impulses are not merely held in check; they are driven out of the field. If they continue to exist, they do so as external obstacles to a volition already formed. They are no longer motives; they are on the same footing with any other difficulty in the way of attainment."[1]

On the other hand, the motives which in the process of deliberation arrayed themselves on the side of the course of action that actually comes to be adopted persist after deliberation is over, as the recognised motives of the voluntary decision. We will the act, because we desire it, or at least have an aversion to omitting it, or to its alternatives. Thus, the state of voluntary decision may be analysed as follows: (1) there is the belief that so far as in us lies we are going to carry out a certain course of action; (2) this belief is founded on that kind of reason which we call a motive. It is recognised as having its ground in our present conative tendencies. Thus we may define a Volition as a desire qualified and defined by the judgment that so far as in us lies we shall bring about the attainment of the desired end because we desire it.

§ 5. **The Forming of a Decision.**—We have yet to examine how the state of decision supervenes on that of deliberation. At this point the vexed question of *free-will*, as it is called, arises. According to the libertarians, the decision, at least in some cases, involves the intervention of a new factor,

[1] Article by author on "Voluntary Action," *Mind*, N.S., vol. v., No. 19, p. 357.

not present in the previous process of deliberation, and not traceable to the constitution of the individual as determined by heredity and past experience. The opponents of the libertarians say that the decision is the natural outcome of conditions operating in the process of deliberation itself. There is according to them no new factor which abruptly emerges like a Jack-in-the-box in the moment of deciding.

Now it must be admitted that the transition from the state of indecision to that of decision is often obscure, and that it frequently appears to be unaccountably abrupt. This makes it difficult or impossible to give a definite disproof of the libertarian hypothesis on psychological grounds. But certainly the *onus probandi* rests with those who maintain the intervention of a new factor which is not a development or outcome of previous conditions. If we cannot definitely disprove the presence of such a factor, we can at least say that the facts are far from compelling us to assume its existence.

Deliberation may be regarded as a state of unstable equilibrium. The mind oscillates between alternatives. First one conative tendency becomes relatively dominant, and then another. The play of motives passes through all kinds of vicissitudes, as the alternative courses of action and their consequences are more fully apprehended in relation to the Self. As the process advances, equilibrium tends to be restored. New developments of conative tendency cease to take place; deliberation comes to a standstill because it has done its work. In this relatively stationary condition, it may be that one of the alternatives, with the motives for it, has a decided and persistent predominance in consciousness, so that the mind no longer tends to revert to the others. At this point the mind is made up, and the result is formulated in the judgment, "I will do this rather than that."

But there are other cases which present more difficulty. It may happen that deliberation comes to a standstill without any one alternative acquiring a definite predominance. The mind tends first to one and then to the other without result. No new developments occur which tend to give a superiority to either, and the result is hopeless suspense. It would seem that under these conditions no voluntary decision ought to supervene, or if it does supervene, it must be due to the intervention of a new factor and is not merely the outcome of the deliberative process. Now as a matter of fact we find that under such conditions voluntary decisions frequently do come into existence. They may even be of wide-reaching importance, like Caesar's determination to cross the Rubicon. But probably in all such instances one or both of two traceable and recognisable conditions of a psychological kind are operative. These are (1) aversion to the continuance of painful suspense, and (2) the necessity for action of some kind. "It may be that though we are at a loss to decide between two courses of action, we are none the less fully determined not to remain inactive. Inaction may be obviously worse than either of the alternative lines of conduct. We may then choose one of them much in the same way as we take a cigar out of a box, when it is no matter which we select."[1] In view of the necessity for action, a comparatively slight predominance of the motives for one alternative may be sufficient to determine decision, though it would have been ineffective under other conditions. Or again, being pressed to decide, either by aversion to the state of irresolution, or by the necessity for doing something, we may simply adopt the course which seems to be uppermost in our minds at the moment,

[1] *Op. cit.*, p. 364.

although we have no confidence that it would remain uppermost if we continued to deliberate. Or we may mentally consent to allow the decision to be determined by some irrelevant circumstance such as the fall of a penny. We determine that if heads turn up we shall do *A*, and that if tails turn up we shall do *B*. Curiously enough, the reverse frequently happens. If heads turn up we do *B*, and if tails turn up we do *A*. This is due in part to an aversion to having one's conduct determined in such an arbitrary and irrelevant way. But it often happens that immediately after the appeal to chance has been made, and has issued in favour of one alternative, the motives for the other alternative are mentally set in contrast, not with the opposing motives present in preceding deliberation, but with the trivial result of the appeal to chance. They thus acquire a momentary predominance which determines voluntary decision.

Sometimes volition takes place before the process of deliberation has fully worked itself out. In this way, acts come to be decided on which would have been suppressed if they had been more fully considered. Here again, the necessity for acting in some way, and impatience of the state of indecision, are operative factors. But the reason often lies in the intensity of some impulse of the present Self which derives its strength, not from its relation to the total system of conduct, but from the circumstances of the moment.

In the vicissitudes through which the process of deliberation passes, it will often happen that this isolated impulse through its momentary intensity will acquire such a predominance as to arrest the full development of other motives, which, if they had come into play, would have given rise to a different decision. The decision which thus takes place after imperfect deliberation is

generally called impulsive. It is not supposed to be voluntary in the same degree as that which takes place after fuller deliberation. The agent often commits the act knowing that he will live to repent it. Most cases of yielding to temptation are cases of deliberation arrested and cut short by the transient strength of a present impulse. It is in such instances that the agent is most keenly aware in retrospect that he might have acted otherwise than he actually did. He feels that the act does not fully represent his true self. If he had fully developed all the motives which were inoperative owing to imperfect deliberation, the momentary impulse might have been suppressed instead of realised.

§ 6. **Fixity of Voluntary Decision.**—The persistence with which a voluntary decision, when once formed, maintains itself against obstacles is often much greater than can be accounted for by the strength of the desire which was its motive at the outset. There are many reasons for this. One is that the line of conduct determined on is identified with the conception of Self. "When I judge that in so far as in me lies I shall realise a certain end, the endeavour to realise that end becomes *ipso facto* an integral part of the conception of myself. Failure to realise it is regarded as *my* failure, *my* defeat. Thus volition becomes strengthened in the face of obstacles by all the combative emotions. These are of varying kinds and of varying degrees of strength in different individuals; but all tendencies to hold out or struggle against opposition, merely because it *is* opposition, are enlisted in the service of the will, inasmuch as the idea of the line of conduct willed is an integral part of the idea of Self."[1]

"The fixity of will is also strengthened, often in a very

[1] *Op. cit.*, p. 358.

high degree, by aversion to the state of irresolution. Suspense is in itself disagreeable; and when we have emerged from it by a voluntary decision, we shrink from lapsing into it once more. Besides this, prolonged and repeated indecision is highly detrimental in the general conduct of life. The man who knows his own mind is far more efficient than the man who is always wavering. Hence in most persons there is a strong tendency to abide by a resolution, just because it is a resolution. This tendency is greatly strengthened by social relations. If we are weak and vacillating, no one will depend upon us; we shall be viewed with a kind of contempt. Mere vanity may go far to give fixity to the will."[1]

Volition also becomes fixed by the action which follows on it. So soon as we have attained the settled belief that we are going to follow out a certain line of conduct, we immediately begin to adapt our thoughts and deeds to this belief. We thus come to be more and more *committed* to the course determined on. To withdraw from it would be to disturb our arrangements; to baulk expectations raised in others; and to arrest the general flow of our own mental activity. The more the mind has become set on one thing, the more it would be upset by being diverted to another. If I have once decided on going to New Guinea to investigate the manners and customs of savages, instead of staying at home to lecture on psychology, the whole direction of my mental activity flows into channels corresponding with my preformed resolution. I begin to read up books about savage tribes and about New Guinea in particular. The arrangements for my outfit and voyage, the kind of work I am going to do, the kind of adventures I shall meet with, the men I am to co-operate with, and

[1] *Ibid.*, p. 359.

other topics such as these, engross my mind. The more advanced this process is the greater fixity does my volition acquire. "To disturb it is to disturb the whole system of tendencies with which it has become interwoven. In this way I commit myself to such an extent that it becomes impossible to draw back."[1]

Perhaps the fixity of volition is not adequately accounted for by reasons such as these. There appear to be individual differences in this respect which depend upon inherited constitution, so that they cannot be explained by psychological generalities. In some men infirmity of purpose appears to be innate. They change like a weathercock, and can never be relied on. Others follow up their voluntary resolutions with a dogged persistence which is often utterly unreasonable. Some men are born obstinate, and others vacillating.

§ 7. "Action in the Line of Greatest Resistance."— Some volitions take place and are maintained only by an effort. This is especially the case when voluntary decision follows some general principle of conduct or some ideal aim, in opposition to an intense impulse of the present Self which is excited and maintained by the actual conditions existing at the time. Professor James has laid great emphasis on this experience. "We *feel*, in all hard cases of volition, as if the line taken, when the rarer and more ideal motives prevail, were the line of greater resistance, and as if the line of coarser motivation were the more pervious and easy one, even at the very moment when we refuse to follow it. He who under the surgeon's knife represses cries of pain, or he who exposes himself to social obloquy for duty's sake, feels as if he were following the line of greatest temporary resistance. He speaks of con-

[1] *Op. cit.*, p. 358.

quering and overcoming his impulses and temptations. But the sluggard, the drunkard, the coward, never talk of their conduct in that way or say they resist their energy, overcome their sobriety, conquer their courage, and so forth."[1]

There can be no doubt that Professor James here describes the facts accurately. But he proceeds to interpret them as evidence in favour of the libertarian view. If volition is merely the outcome of preceding psychological conditions, it must follow the line of least resistance, but in the cases described it follows the line of the greatest resistance. This would seem to imply the intervention of a new factor. Before admitting this conclusion, we must analyse more carefully the experience on which it is based.

We said in § 4 that when a voluntary decision was once formed, "opposing conative tendencies either cease to operate, or they appear only as difficulties or obstacles in the way of carrying out our decision." The disappearance of opposing tendencies, on the one hand, or their persistence as obstacles, on the other, are the two alternatives which correspond to action in the line of least resistance and in the line of greatest resistance. Now whether they persist or disappear depends upon the presence or absence of circumstances over which we have no control. The simplest case is that in which we voluntarily decide in opposition to some present organic craving, such as the craving for drink. The craving itself is maintained by organic conditions which continue to operate both in the very moment of decision and after the decision is made. Thus, to use the phraseology of Professor James, the volition is "hard" because it is both formed and carried out against a persistent obstacle. On the other hand, if

[1] *Principles of Psychology*, vol. ii., p. 548.

the decision is in favour of indulging the animal appetite, counter motives tend to disappear altogether, instead of persisting as obstacles. They are not maintained by organic conditions, nor are they obtruded on the mind by any other circumstances. As soon as the man has given way to temptation and begins to drink, he loses sight of the considerations which had previously tended to restrain him. Besides this, the drink itself, if he takes enough of it, soon obliterates any lingering traces of reluctance. Thus in resolving to drink the man certainly decides in the direction of least resistance; indeed, there may be virtually no resistance at all. On the other hand, in deciding to restrain his appetite, he decides in the direction of greatest resistance, because the appetite itself still persists after his decision.

The case is not essentially dissimilar when the persistence of motives as obstacles is due to other circumstances. The interests opposed to the course of action adopted may be so complex, they may play so large a part in our life, that they continue to obtrude themselves upon us even when we are deciding or have decided that their realisation is not to be identified with our conception of the future Self. They thus persist as obstacles in the moment of resolution, and after resolution. Regulus, in determining to return to Carthage, could hardly dismiss from his thoughts all that he was giving up and the violent death which awaited him. Perhaps if he had decided to remain at Rome, his mental conflict would have been much less acute. Surrounded by family and friends, and with all kinds of congenial channels open for his activity, he would probably have been able to a large extent to avoid dwelling on the thought of his violated promise.

If this analysis be correct, cases of "hard" volition do not show that, in the process which leads up to a decision,

the weaker motives triumph. We must carefully separate two questions. The first is, How does the voluntary decision issue out of the previous process of deliberation? The other is, How far do opposing tendencies become inoperative when the voluntary decision is made? In proportion as they remain operative, they constitute obstacles and render volition "hard." But this has nothing to do with the psychological conditions which determine the volition. It in no way proves that these conditions are not adequate, and that a new factor such as the libertarians assume is required to account for the result.

§ 8. **Volition and Bodily Activity.**—A voluntary decision is normally followed by action which carries or tends to carry it into effect. Setting aside for the present the case of voluntary attention, where the will merely determines the direction of thought, we have here to consider the relation between volition and bodily movement.

Motor efficacy is not essential to the state of voluntary decision as a psychical fact. "The question as to the nature of a certain mode of consciousness is quite independent of the question whether or not this mode of consciousness will be followed by a certain train of occurrences in the organism and in the environment. If I will to produce an explosion by applying a lighted match to gunpowder, my volition is none the less a volition because in the course of its execution the match goes out or the powder proves to be damp. Similarly the volition is none the less a volition if it turns out that my muscular apparatus refuses to act, or acts in a way contrary to my intention. The connexion between certain modes of consciousness and corresponding movements of the limbs is necessary to the maintenance of our existence; but it does not enter into the constitution of the conscious state which precedes the executive series of occurrences. When the conscious state

is one of volition, it is necessary that the subject should look forward to the bodily movements, either as practically certain or at least as possible. A belief of this kind is an essential ingredient of the voluntary attitude. But the existence of the belief is in itself sufficient. Its truth or falsehood is a matter of indifference. In a precisely analogous way we must, in determining to produce a gunpowder explosion, assume that the powder is or may be dry enough to take fire. But it is by no means necessary that the gunpowder in point of fact should be dry."[1]

Normally, however, volition is followed by corresponding movements. How does this take place? Professor James has supplied what appears to be a satisfactory answer to this question. The passage of volition into movement is according to him a special case of the general tendency of ideas to act themselves out. The mere representation of an action tends to give rise to the action itself, and will do so in the absence of interfering conditions. "Try to feel as if you were crooking your finger, whilst keeping it straight. In a minute it will fairly tingle with the imaginary change of position; yet it will not sensibly move, because *its not really moving* is also a part of what you have in mind. Drop *this* idea, think of the movement purely and simply, with all brakes off, and, presto! it takes place with no effort at all."[2]

It very frequently happens that ideas pass into action without preceding volition. "Whilst talking I become conscious of a pin on the floor or of some dust on my sleeve. Without interrupting the conversation I brush away the dust or pick up the pin. I make no express resolve, but the mere perception of the object and the

[1] Article by author on "Voluntary Action," *Mind*, N.S., vol. v., No. 19, p. 355.

[2] *Principles of Psychology*, vol. ii., p. 527.

fleeting notion of the act seem of themselves to bring the latter about."[1] Experiences of this kind are very common. We have already had occasion to dwell on the tendency of ideas to express themselves in imitative gestures; and in that connection we adduced other evidence to show that ideas tend to act themselves out in proportion to their vividness and dominance in consciousness.

We now turn to the special case of volition. Volition is normally followed by movement, because the voluntary decision gives to the representation of the act decided on a settled predominance in consciousness as against the representations of alternative courses. This is Professor James's account of the matter, but it seems possible to push analysis somewhat further, so as to show how the predominance arises. During the process of deliberation, the subject is as yet uncertain what he is going to do. Incompatible courses of action are ideally represented as possible alternatives. With the voluntary decision comes the belief that one of them is to be carried out to the exclusion of the others. It is this belief which gives to the idea of the action the predominance leading to its execution.

This is perhaps best illustrated by what takes place in the hypnotic state. It is well known that the hypnotised subject responds passively to all kinds of suggestions from the hypnotiser. Within certain limits it is only necessary to suggest the idea of an action or group of actions to bring about performance. "Tell the patient that he cannot open his eyes or his mouth, cannot unclasp his hands . . . and he will immediately be smitten with absolute impotence in these regards."[2] Tell him that he is a pig or a

[1] *Ibid.*, p. 522.
[2] *Op. cit.*, vol. ii., p. 603.

lion or a baby or Julius Caesar, and he will proceed to enact the part. "Subjects in this condition will receive and execute suggestions of crime, and act out a theft, forgery, arson, or murder."[1] Now though the suggestion of the mere idea tends to have this effect more or less, yet the result can be produced with far more certainty and conspicuousness when the operator imposes on his patient a *belief* that he is such and such a person, or that he is going to do such and such a thing. Hence suggestions mainly take the form of assertions, such as, You will do this, You will not do that. When the patient has once adopted the belief that he is going to act in a certain manner, the ideas of alternative courses are suppressed, and the action follows.

It seems probable that the predominance which voluntary decision gives to the idea of a line of action is essentially connected with the belief that this is the line which we are going to follow out, to the exclusion of other alternatives.

§ 9. **Involuntary Action. Fixed Ideas.**—In the strictest sense an involuntary action is one which takes place in opposition to a voluntary decision. Thus if I am determined to make a certain stroke at billiards, and if in the moment of action the muscular apparatus fails me, so as to give rise to an unintended jerky movement, my action is strictly involuntary. But cases like this do not interest us here. What we are concerned with is the defeat of the will, not by an accidental circumstance interfering with its execution, but by an antagonistic impulse. We have an example of this in the unsuccessful effort to restrain a reflex movement over which we have normally sufficient control. Suppose a party of soldiers to be climbing a crag

[1] *Ibid.*, p. 605.

in the dark so as to surprise a castle. Noiselessness is a condition of success. A sneeze or a cough probably means defeat and loss of life. Now it is possible to a large extent to restrain the actions of sneezing and coughing; but if the irritation of the mucous membrane is sufficiently intense and persistent, temporary repression only makes the ultimate outburst more violent. One of the soldiers may be determined not to sneeze, although the impulse is so strong as to give him great uneasiness. The tendency to sneeze is a conation; to restrain it is painful, and to indulge it would be a relief. None the less, if the impulse prove irresistible the sneeze is involuntary.

In this instance the involuntary act follows on organic sensation and not on an idea. It does not take place because the ideal representation of the act of sneezing has become predominant, but merely because of the intense irritation of the mucous membrane.

There is, however, a wide class of instances in which the will is defeated by the obtrusive intensity of an ideal representation. In spite of the mental assertion that we are not going to perform a certain action, the idea of that action, owing to other conditions, acquires and maintains a dominance in consciousness which ultimately leads to its realisation.

This may happen even when the ideally represented object is not desired, and even when the only feeling towards it is that of intense aversion. A man standing on an eminence, such as the top of a cathedral tower, and looking down into the vast depth beneath him, thinks of what it would be like to throw himself down. Owing to the fascinating interest of the thought the idea of the action and its consequences obtrudes itself upon him with intense vividness, and he feels himself impelled to carry it into execution. He may have a very distinct and clear

volition to the contrary; he may utterly refuse to identify the idea of the action with the idea of Self. He mentally asserts, I shall not, or, I will not; and as a rule this voluntary decision triumphs over the "fixed idea" as it is called. But it still remains true that the fixed idea derives its vivacity from conditions independent of the will; and it is always possible that the impulse to realise it may acquire sufficient strength to overcome a contrary volition. Some people actually do throw themselves down precipices in this way.

This result however is not common under normal conditions. It is in pathological cases that the fixed idea becomes really formidable. This is partly due to imperfect powers of deliberation. The conative tendencies which would have restrained the act lie in abeyance; the concept of the Ego in its unity and totality can only be very inadequately developed in relation to the act contemplated. But there are instances in which this explanation does not apply. In such instances it is not the absence of inhibiting tendencies, but the positive strength of the impulsive idea which leads to action. Ribot gives a case of a man who was possessed by the idea of killing his mother. "'To you,' said he, 'I owe everything; I love you with all my soul; yet for some time past an incessant idea drives me to kill you.'" Tormented by this temptation, he leaves his home, and becomes a soldier. "Still a secret impulse stimulated him without cessation to desert in order to come home and kill his mother." In time, the thought of killing his mother gives place to that of killing his sister-in-law. Someone tells him that his sister-in-law is dead, and he accordingly returns home. "But as he arrives he sees his sister-in-law living. He gives a cry, and the terrible impulse seizes him again as a prey. That very evening he makes his brother tie him fast. 'Take a solid

rope, bind me like a wolf in the barn, and go and tell Dr. Calmeil . . .' From him he got admission to an insane asylum. The evening before his entrance he wrote to the director of the establishment: 'Sir, I am to become an inmate of your house. I shall behave there as if I were in the regiment. You will think me cured. At moments perhaps I shall pretend to be so. Never believe me. Never let me out on any pretext; the only use I shall make of my liberty will be to commit a crime which I abhor.' "[1]

This is a case in which the fixed idea was not executed; but it easily might have taken effect, and many similar cases could be adduced in which it actually did so. What it is important to note is the conflict between the Self as a whole arranged on the side of the volition, and the isolated impulse to action which derives its strength merely from the fixation of an idea by pathological conditions. In these cases the conation which resists the will arises primarily from the fixation of the idea in consciousness. The fixation of the idea itself does not arise from any desire for its object. But under normal as opposed to pathological conditions, the commonest cases of involuntary action are those in which an idea becomes fixed through intense appetite or craving arising from organic conditions. To take an example given by Mr. Shand, a man may have a morbid craving for drink or opium, and the ideas which move to its satisfaction may at last become irresistible. Now here there are four possible alternatives.

In the first place, indulgence in the drink or opium may be contrary to the man's express volition at the moment when he drinks. This is probably a very rare occurrence. As a rule, when the impulse is strong enough

[1] Ribot, *Maladies de la Volonté*, p. 77, quoted by James, *Principles of Psychology*, vol. ii., p. 542.

to produce action, it is also strong enough to prevent or displace an opposing volition.

In the second place, there may have been a preformed resolution to refrain from the action; but at the moment at which it takes place the contrary impulse acquires such intensity as to pre-occupy the field of consciousness, so that the volition is temporarily in abeyance. Here action at the moment is non-voluntary rather than involuntary; but taking a broader view we may call it involuntary, because it runs counter to a volition which has only lapsed for the time being, and recurs in consciousness immediately after the act is over, in the form of remorse.

In the third place, the action may take effect before a voluntary decision has been arrived at. In the midst of the conflict of motives, the idea corresponding to the animal appetite may become so vivified as to pass into action while the process of deliberation is still working itself out. We may act before we know our own minds. A man, while still mentally hesitating whether he is to drink a glass of spirits or not, will find that the organic craving has so vivified the idea of drinking that he is swallowing the spirits before he has determined whether to do so or not. The action is then involuntary, because it interrupts the process of forming a volition. It may also be involuntary in a deeper sense; it may be that from the constitution of the man's whole nature, he would certainly have willed otherwise if full deliberation had been possible before acting.

In the fourth place, the organic craving may be the motive of a genuine volition, and the action may therefore be voluntary at the time at which it takes place. None the less, there is a sense in which the action may be regarded as involuntary. A comparison may be made between the totality of interests defeated by indulging in

the drink or opium, and the animal craving itself considered as a relatively isolated impulse. If the craving were taken away the Self would still be left. If on the other hand all the interests which are opposed to the indulgence were taken away, there would be little left but the morbid appetite itself. Thus the denial that the act is voluntary may have a good meaning. It may mean that the volition of the moment is discordant with the general volition of a lifetime, so that the intervals between the periods of indulgence are embittered by remorse. It is supposed that the morbid craving by its isolated intensity prevents full deliberation. There is, it is assumed, in the man's nature a vast system of conative tendencies which, if they had found fair play, and developed themselves in consciousness, would have determined volition even if they did not determine action. Of course, when we regard the question in this way, the voluntariness or involuntariness of an action is a matter of degree. We tend to think of the opium-eating of a man like Coleridge as a kind of external misfortune, because it is alien from the ideal aspirations which we regard as constituting his true Self. To this extent, we do not hold Coleridge responsible so much as the unfortunate craving which possessed and mastered him. In the case of a man of meaner nature, our judgment would be very different.

§ 10. **Self-Control.**—All the cases of involuntary action which we have discussed in the last section are cases of deficiency of self-control. Self-control is control proceeding from the Self as a whole and determining the Self as a whole. The degree in which it exists depends upon the degree in which this or that special tendency can be brought into relation with the concept of the Self and the system of conative tendencies which it includes. Failure in self-control may arise from one or both of two conditions. On

the one hand, the overpowering intensity of a relatively isolated impulse may prevent the due evolution of the concept of Self even when this is fully formed and organised. On the other hand, the defect may lie in the degree of development which self-consciousness has attained, or in organic conditions, mostly of a pathological kind, which disorganise the Self, and prevent the full development of its normal contents. To quote Dr. Clouston: "The driver may be so weak that he cannot control well-broken horses, or the horses may be so hard-mouthed that no driver can pull them up. Both conditions may arise from purely cerebral disorder. . . . An imbecile or dement, seeing something glittering, appropriates it to himself. . . . The motives that would lead other persons not to do such acts do not operate in such persons. I have known a man steal who said he had no intense longing for the article he appropriated at all, at least consciously, but his will was in abeyance, and he could not resist the ordinary desire of possession common to all human nature." [1] On this Professor James remarks: "It is not only those technically classed imbeciles and dements who exhibit this promptitude of impulse and tardiness of inhibition. Ask half the common drunkards you know why it is that they fall so often a prey to temptation, and they will say that most of the time they cannot tell. It is a sort of vertigo with them. Their nervous centres have become a sluice-way pathologically unlocked by every passing conception of a bottle and a glass. They do not thirst for the beverage; the taste of it may even appear repugnant; and they perfectly foresee the morrow's remorse. But when they think of the liquor or see it, they find themselves preparing to

[1] *Clinical Lectures on Mental Diseases*, quoted by James, *Principles of Psychology*, vol. ii., pp. 540-541.

drink, and do not stop themselves; and more than this they cannot say."[1] We have a good example of the inverse case in which the concept of Self is fully organised and easily developed, but finds itself impotent in the face of an abnormally intense impulse, in the case of the man who was possessed by the fixed idea of murdering his mother.

The process of ideal construction through which the concept of Self grows, is gradual, and reaches different degrees of perfection in different persons. The more highly systematised and organised it becomes, the more effective it is. Self-control is greatest in the man whose life is dominated by ideals and general principles of conduct; but this involves a development of conceptual consciousness which is absent in children and savages. We accordingly find that children and savages are to a great extent creatures of impulse; they have comparatively little power of deliberation, so that action tends to follow the conative tendency which is excited and supported by the circumstances of the moment. Remoter considerations are comparatively inoperative. The Self which determines action is predominantly the present Self, not the total Self as ideally represented. Thus the savage wastefully exhausts his present store in riotous indulgence, and is improvident of the future. He cannot be brought to work in a regular and persistent manner. He may be industrious enough for a time in order to gain a little money, or some other object which he happens to covet at the moment; but so soon as his immediate end is attained, he thinks no longer of working, but only of enjoying his gains. He is scarcely capable of pursuing a distant aim, which requires persistent and repeated activity continued for a long time without obvious result. Ends which are at least in part

[1] *Ibid.*, p. 541.

immediately attainable seem to be the only ends which effectively determine his action. For this reason he does not appreciate the value of time. The end he is pursuing at the moment has for him an absolute rather than a relative importance. He does not regard it merely as part of the great business of life which must be subordinated to the whole. He does not feel the necessity of completing the transaction in which he is interested in time to proceed to other matters. Hence he often sorely tries the patience of the civilised European by spending altogether disproportionate time and energy on relatively trivial bargains, etc. Such mottoes as "time is money" do not appeal to the savage mind. The same holds of young children, as we all know. The bird in the hand is to them worth a thousand in the bush.

§ 11. **Voluntary Attention.**—A voluntary determination may be either a determination to perform certain bodily movements or a determination to attend to certain objects. Attention, so far as it follows upon an express volition to attend, is called *voluntary attention*. All attention which is not so initiated is *non-voluntary* or spontaneous. When we attend not merely without an express volition to attend, but in opposition to such a volition, attention is in the strictest sense *involuntary*, and not merely non-voluntary. A good illustration of voluntary attention is to be found in "certain psychological experiments, in which the experimenter fixes his attention on an uninteresting object, in order to observe phenomena attending the process of fixation. He determines to attend to the object for the sake of observing what takes place when he attends to it. The spontaneous and the voluntary direction of attention are not merely distinct: they are also antagonistic. Everyone desires to avoid futile worry and fret; but no one has a mind so well regulated as to be able to divert his thoughts

at will from irremediable misfortune, and unavoidable sources of anxiety. When, owing to overwork, our minds are besieged at night by a subject which has occupied us during the day, we vainly endeavour to compose ourselves to rest. "We *will* to expel the intrusive thoughts; but we cannot keep up the effort persistently; and so soon as it is relaxed, the spontaneous movement of attention recurs, and murders sleep."[1] "All mental training and discipline depend on the victory" of voluntary attention. "This usually takes time. The resolution to devote attention to an unattractive subject can only succeed after repeated effort followed by repeated failure. The mind wanders at first, and requires to be again and again recalled to its task. We form a design to occupy ourselves with a certain topic. So soon as this design is being carried out, we cease to think of it and of the motives which prompted it. We think instead of the subject-matter which we had resolved to study. But this subject-matter is, *ex hypothesi*, uninteresting. It cannot, therefore, command attention. Accordingly our thoughts wander from the point, and have to be recalled by a renewed effort of will. This fitful alternation of attentiveness and inattentiveness may continue until fatigue and tedium cause the task to be abandoned. On the other hand, interest may grow up as the subject of study becomes better known. When this happens, the periods of concentration become gradually prolonged, until the necessity for deliberate effort ceases to exist. Thus the function of voluntary attention in such cases is to create spontaneous attention. When it fails in this, it produces only exhaustion and disgust. A person condemned to spend his whole life in constantly reiterated efforts to fix his mind on a hopelessly uninteresting topic,

[1] Author's *Analytic Psychology*, vol. i., p. 241.

would go mad, commit suicide, or sink into a state of coma. Voluntary attention belongs coincidently to the province of intellect and to that of practical volition. It is the '*conduct* of the understanding,' and, like external conduct, is subject to moral law. In intellectual morality the fundamental virtue is patience."[1]

The voluntary determination to attend plays a large and important part in the more complex forms of deliberation. We may compare the value of conflicting motives in relation to the total system of our lives; and we may find that considered from this point of view a certain motive or group of motives has not the strength and prominence which it ought to have. We may then attempt to give it this strength and prominence by voluntarily turning our attention in a certain direction. Thus a candidate preparing for an examination may find in himself a strong disposition to laziness, tempting him to spend a day in idleness. He may at the outset very faintly realise the special considerations which make such a course inadvisable: but he may at the same time know that these considerations are important, and that if he neglects them he will bitterly regret doing so. This at the outset may not constitute a motive sufficient to lead to a definite decision to apply himself to work instead of play; but it may be sufficient to give rise to the voluntary decision to fix attention on the reasons for working, and so to give to these reasons the strength and liveliness which they initially lack. In this indirect way he may reach a distinct and effective decision to go to work with steadiness and energy. It is in such cases as these that the consciousness of freedom is most conspicuous. For in such cases we not only will our act, but in a manner we will our volition. The voluntary

[1] Author's *Analytic Psychology*, vol. i., p. 242.

determination to act issues out of the voluntary determination to attend; and the voluntary determination to attend directly and obviously depends on the controlling influence of the concept of the Self as a whole.

§ 12. **True Freedom.**—It must not be supposed that anything we have said in this Chapter implies a denial of the freedom of the will in the sense in which such freedom is claimed by the ordinary consciousness of humanity. We have only thrown doubt on a certain theory of the nature of such freedom—the theory which goes by the name of *libertarianism*, or of *contingent choice*. By *contingent choice* is meant a choice which does not issue out of the total process of mental life in accordance with psychological laws, but springs into being of itself as if it were fired out of a pistol. This theory makes free decision arise by a kind of spontaneous generation. Those who oppose libertarianism sometimes call themselves Determinists. Some determinists agree with the libertarians in identifying freedom with contingent choice; they only disagree in denying the existence of such choice. As against both these, we maintain that freedom consists in self-determination, and that self-determination means self-control. Self-control, as we have defined it in § 10, consists in "control proceeding from the Self as a whole and determining the Self as a whole. The degree in which it exists depends upon the degree in which this or that special tendency can be brought into relation with the concept of the Self and the system of conative tendencies which it includes."[1] Another way of putting this is to say that acts are free in so far as they flow from the character of the agent; for character is just the constitution of the Self as a whole. Character exists only in so far as unity and continuity of

[1] Page 626.

conscious life exists and manifests itself in systematic consistency of conduct. Animals can scarcely be said to have a character, because their actions flow from disconnected impulse. "If an animal could be supposed to think and speak, it could not refer its actions to itself, but only to its impulse at this or that moment."[1] Character is little developed in savages as compared with civilised men; for they have relatively little power of considering particular actions in relation to an organised system of conduct. Now the development of character and the development of freedom are two aspects of the same process. A man's acts "are his own only when he *is himself* in doing them,"[2]—when they express his total character rather than his momentary impulse.

It follows from this account that freedom is an ideal which can never be completely realised, and this ideal coincides with that of self-realisation, as expounded in Professor J. S. Mackenzie's *Manual of Ethics*.[3] But the last word about freedom lies neither with Psychology nor with Ethics. Its full discussion involves an examination of the relation between the thought and will of the individual mind, and the reality of the universe. This relation from the point of view of any finite science such as Psychology is utterly inexplicable. The more closely and conscientiously we endeavour to explain it by the ordinary categories of any special science, the more plain it becomes that so regarded it is a miracle,—indeed the miracle of miracles. Psychology cannot explain how it is possible that an individual can consciously mean or intend something. To say that he has a present modification of consciousness which resembles an object is very far from

[1] J. S. Mackenzie, *Manual of Ethics*, fifth edition, p. 97.

[2] *Ibid.*, p. 98.

[3] See especially bk. ii., ch. v., § 12, "The True Self."

being the same thing as saying that he has a thought of this object,—that he means or intends it. I may now have a toothache, and you may have a toothache exactly like it, but my toothache is not the thought of your toothache. Will and thought are not explicable by such categories as causality, substance, resemblance, or correspondence. Hence, truth and freedom are ultimately topics for the metaphysician. As psychologists, we deal not with the ultimate possibility of will and thought, but only with their mode of occurrence as time-processes taking place in the individual mind.

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